CHNOLOGY DEPARTMENT

WITH METALLURGICAL SECTION

The Chemical Age

VOL LXII 4 MARCH 1950 No 1599

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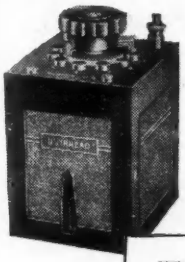

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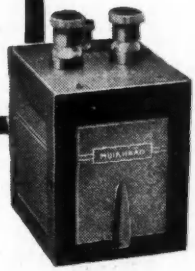

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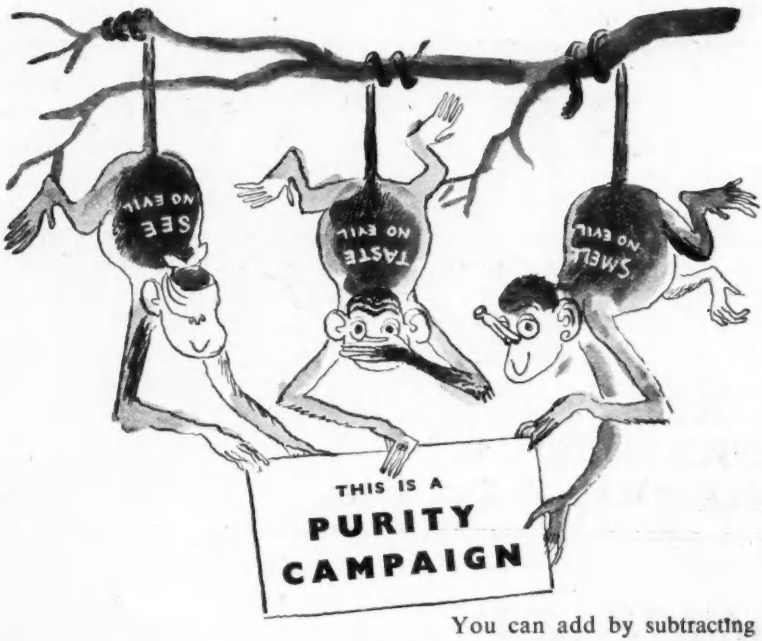

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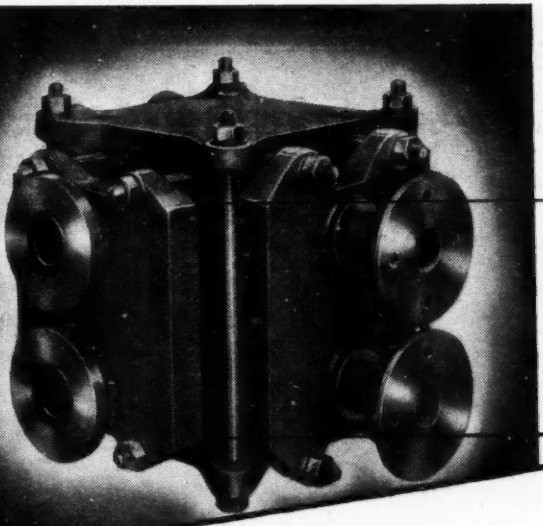

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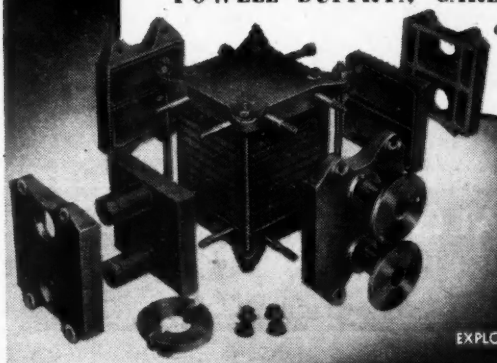

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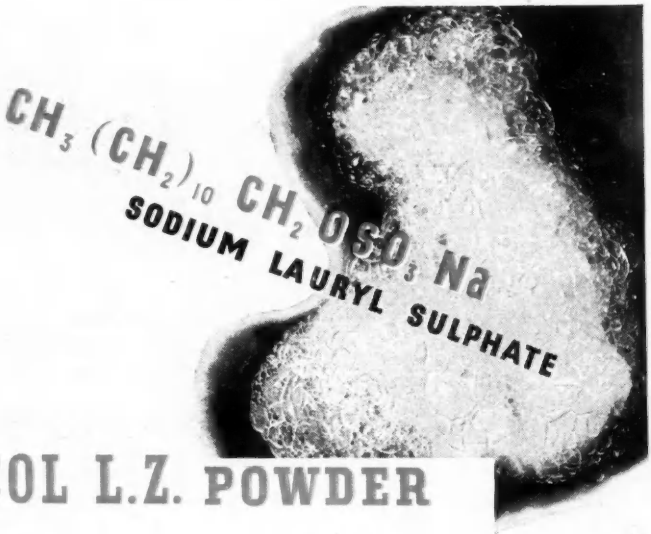

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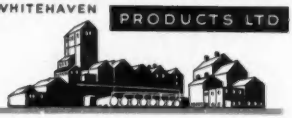

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The
Chemical Age

The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Volume LXII 4 March 1950 Number 1599

Creatable Resources

THAT there are two kinds of money has long been realised by most individuals and organisations. Personal bank accounts, company balance sheets, and even post-war budgets express so far as they are able this basic tenet of economic order—capital is money for conservation or creative investment and income alone is money for outright expenditure. When income is able to make additions to capital, economic man is making progress. When capital has to suffer subtractions to meet income liabilities, economic man is in a sorry state of decline. No one will deny that this is a deep-rooted instinct.

It is strange that this sense of conservation and prudence has rarely influenced modern man in his attitude towards the world's supplies of raw materials. He has paid so much attention to pounds and pence and dollars and dimes, which are no more than changing tokens; so little to the materials which in one way or another they must ultimately represent. The "dollar gap" is the immediate problem of Britain and Europe. When the United Nations points out that a rapidly expanding world population is based upon dwindling and non-renewable sources of raw materials, very little notice is taken.

The current issue (74, 1) of the *Journal of the Royal Institute of Chemistry* (itself, incidentally, in a new and attractive size and format which slightly increases its consumption of raw materials) contains a most valuable article on this subject by Dr. F. N. Woodward. His theme is concisely expressed by its title "Creating Resources." "The world population is now about 2000 million and in 50 years, if it increases at the present rate, it will be half as much again . . . man will be driven to feed, clothe, and house this staggering potential population increase from the same resources which, up to now, he has been destroying at an alarming rate and, in so doing, has failed signally to reach or maintain a reasonable standard of living for more than one-third of the present inhabitants of the earth."

This alarming picture of the future has been forcefully expressed by a number of men in recent years, notably by Lord Boyd Orr, William Vogt in his book, "Road to Survival," and Osborne in "Our Plundered Planet." Its urgency has impressed no more than a slender minority. Too many

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

nations are immersed in their own struggles for economic survival. The present problem of the Eastern and Western worlds outweighs the supply problem of the generations to come. Few note that any progress that we may make towards easing the present political and economic gaps of the world will be empty achievement if populations and demands rise while supplies of raw materials remain static—or fall.

Dr. Woodward draws attention to the great possibilities of industrial biosynthesis. Not yet accepted as a significant means of creating renewable resources, biosynthesis can nevertheless give an impressive account of itself. The German wartime use of enzymes to produce 16,000 tons of food yeast from sulphite pulp waste, and the similar Jamaican venture using sugar molasses as the fermentable carbohydrate source, are means by which chemists may one day have to balance protein deficiencies for the swollen populations. Limited land acreages can produce carbohydrates in much greater abundance than proteins.

New Swedish work has developed another enzyme process by which carbohydrates can be converted into fats by an unusually efficient fermentation synthesis. Dr. Woodward quotes a calculation showing that a 1000 lb. bullock can produce 1 lb. of protein in a day, but similar weights of soya bean seed and *Torulopsis* yeast can, in the same time, respectively produce 86 lb. and 4000 lb. of protein. The qualitative contrast between these different kinds of protein need not be stressed—the delights of bacon or rump steak cannot be denied. But for a world which may have to support 3000 million in the year 2000 the comparison 1:86:4000 will be inescapable.

Unless farmers can increase their optimum outputs of protein per time and area unit, they may be largely become producers of carbohydrates and cellulose for biochemical conversion into proteins and fats. Biosynthesis is in its infancy and what it can claim so far is only a pointer to future potentialities. Agriculture, despite its recent rejuvenation in some parts of the world, is getting on in years and its potential rate of output expansion must be measured in minor percentages per annum. Fortunately the argument that agricultural expansion must ultimately be stemmed by lack of labour is hardly logical if world population is to rise by 50 per cent in the next 50 years.

Notes and Comments

Nationalisation Halted

THE decisive check which the country administered last week to the spread of Socialist doctrine in action to the detriment of individual productiveness and initiative might well have called forth a spontaneous act of thanksgiving. There has been, instead, a widespread tendency in many responsible quarters to see the result of the General Election, because it conferred full executive powers on neither of the principal contestants, as being an unmitigated misfortune. Now that the danger has passed, few seem willing to recall what fate would almost certainly have overtaken many industries, including in all probability large sections of chemical industry, had there been no popular revolt against the Socialist objective of appropriating to the State all the means of production. Bereft of dictatorial powers, the Labour Party can now be trusted to initiate no further essays in experimental economics of a kind to which all responsible opinion has been opposed. More than this, there are now good reasons to hope that the grim results of some earlier excesses may be averted. Ten months have yet to elapse before the ill-conceived legislation to make a State industry of iron and steel comes into effect. Before then, the country will in all probability have been invited to make a more decisive choice of its Parliamentary leaders. That there will be meanwhile an interval of uncertainty is unfortunate for those who have to frame industrial policy. A likely alternative, the predominance of Socialist doctrines in all fields of production, would certainly have imposed on the makers of policy frustration of more than a temporary kind.

Universities and Production

THERE are very few ivory towers within present-day universities and in the science faculties the preservation of detachment from worldly affairs would be rendered very difficult by the increasing two-way traffic with industries. That traffic, however, is still not free or frequent enough, says Dr. W. H. Garrett, M.B.E., who, as director of production of Monsanto Chemicals, has exceptionally good qualifications to judge the effectiveness of the university-industry relationship. He acknowledges ungrudgingly the comparatively new policy which has enabled appropriate departments of chemistry faculties to serve much better the specific needs of industry, but deplores the comparative infrequency of reciprocal information—from industry to the universities—to make known "the forward picture and the technical and economic trends." The deficiency is capable of having unfortunate results such as the release to industry of graduates having only a sketchy understanding of subjects indispensable in a successful industrial career, or the training of too many trainees of one type. Dr. Garrett, speaking last week to the University of Liverpool's Chemical Society, has made out a good case for a much more intimate liaison between the universities and the industrial units. His proposals would find special places in chemical plants for members of the chemistry faculties (taking a year's Sabbatical leave) and send industrial technical staff on occasions back to the universities for refresher courses. He would like to see formed for each major industry a small liaison committee of industrialists and university people. They might help immeasurably to bring about that closer identity of viewpoint which in the U.S.A. has manifestly conferred great benefit on industries. Dr. Garrett, however, is not one of those who see the university primarily as the handmaid of industry. He was talking principally in terms of post-graduate activities and harbours no plots to reshape from outside the vital academic and research policies of the universities.

"Disincentive"

ALL proposals to improve the effectiveness of training and research depend very intimately upon the amount of money made available, which is the subject of the latest issue of "Notes on Grants to Research Workers and Students." In this the Department of Scientific and Industrial Research shows that the scale of allowances to students ranging from £220 a year to £300 (if the student is at Oxford, Cambridge or London Universities) is adequate, though certainly not munificent. The early years of a research career have never been financially rewarding, but it is not easy to produce any logical excuse for the grudging regulation, mentioned in this report, which deprives the student of half the benefit of any fees earned by teaching or demonstration work. Fifty per cent of any such rewards of enterprise is deducted from the grant. Yet it is observed in the same report that "It is considered desirable that a student should undertake a certain amount of demonstrating and teaching work." That work, however, must not exceed six hours in any one week, including time needed for preparation. Since the amount of teaching or demonstrating can only be small, it is purely petty to deduct half the payment made for it. The grants to students are exempt from Income Tax, but the DSIR would seem to be no less punitive than the Department of Inland Revenue. The attitude of mind which this reveals calls to mind the Whitehall administrator rather than DSIR. Other official documents at intervals draw emphatic attention to the shortage of university teachers. Yet young scientists, who can in most cases make a partial contribution, and who must live in Spartan fashion if they depend upon their allowances alone, must lose half the incentive to teach. It is not irrelevant to recall that theatrical and literary agents are content to take 10 per cent, and the income tax collector would allow one-fifth for earned income and then take only 15 per cent of the first £50 and 30 per cent of the next £200. It is a shoddy condition imposed upon an otherwise progressive scheme.

Progress in Ultrasonics

THE transformation of the ultrasonic vibration principle from a laboratory activity to the status of an everyday industrial technique has evidently gained considerable impetus from the enterprising practical work which has lately been carried on in South Wales (*page* 335). That was a highly specialised study, not concerned with the capacity of high frequency vibrations to produce physical and chemical change, and it has yielded some very interesting evidence of the practical scope that exists in the non-destructive testing of welded metals. That research project, like so many fruitful ones, was initiated by necessity. It was essential that welding employed at the Abbey Works, and especially the side butt welds, should be subjected to tests; and, while radiography was, of course, available, it was recognised that what was chiefly needed was the location of faults, not a photograph which in each case would require expert examination. Radiography, moreover, was deemed too expensive for large-scale use. The responsible people at Abbey Works found it worth while to set up their own ultrasonics research department, principally to adapt contemporary equipment to their particular need. The measure of their success is seen in the production of specialised apparatus employing the cathode-ray oscillograph with which even an unskilled operator can rapidly determine whether a steel weld reaches a satisfactory standard. It is in fact very much more discriminating than that, but it is in its mass-production capacity, in which such testing accounts for only 7 per cent of welding costs, that this very practical advance is most promising.

Tin Study Group to Meet

The fifth plenary session of the International Tin Study Group will be held in Paris on March 20.

COMPOSITION OF GELATIN

New Standards Defined

AMENDMENT of the definition of edible gelatin and the limits of its metallic contamination is the subject of a report by the Food Standards Committee, approved for publication by the Minister of Food.

The committee recommends that edible gelatin should be defined as being "the clean, wholesome protein which is obtained by extraction from collagenous material; free from objectionable taste and offensive odour; dissolves completely in warm water to give a clear or translucent colloidal solution; and yields not more than 3.25 per cent by weight of ash."

The limit for arsenic content (now 1.4 p.p.m. arsenious oxide) should be increased to 2.0 p.p.m., the committee recommends, and the lead content reduced from 10 to 7 p.p.m. The present limits for copper (30 p.p.m.) and zinc (100 p.p.m.) should remain unchanged.

Trade opinion was not unanimous on the question of prescribing a jelly strength test. The committee considered that it would be impracticable to impose a suitable jelly strength test, believing that, as supplies become more plentiful, a gelatin of unsatisfactory setting quality would be unlikely to find a ready retail market.

Among the organisations consulted by the committee were the Federation of Gelatine and Glue Manufacturers, Ltd., and the Association of Glue and Gelatine Distributors, Ltd.

Two months are to elapse before steps are taken to prescribe the recommendations in a Food Standards order under the Defence (Sale of Food) Regulations and to revoke the existing order (S.I. 1948, 2460).

Representations from those interested should be made by April 30 by writing to Mr. K. R. Allen, secretary, Food Standards Committee, Ministry of Food, 47 Portman Square, W.1.

Arsenic in Foods

IMPENDING changes in the statutory regulation of permissible content of arsenic in foodstuffs and beverages, originally formulated by a Royal commission in 1903, are foreshadowed by the publication by the Ministry of Food of a report of the Metallic Contamination Sub-Committee of the Food Standards Committee. The proposals, which will not be implemented for three months, to permit further representations to be made, would permit some

(continued at foot of next column)

slight relaxation of the 1903 requirements in respect of some food adjuncts (colourings, edible gelatin, etc.). The new statutory limits proposed are these:—

Food	Parts per million Arsenic (As)	Arsenious Oxide (As_2O_3)
1. Food colourings containing more than 10 per cent of colouring matter	5.0	6.6
2. Beverage base—		
(*a*) Total solids up to 35 per cent	0.1	0.14
(*b*) Total solids between 36 per cent and 69 per cent ...	0.5	0.7
(*c*) Total solids over 70 per cent	1.0	1.4
3. Edible gelatin	2.0	2.7
4. Dried herbs	5.0	6.6
5. Spices	5.0	6.6
6. Dried liquorice extract	5.0	6.6
7. Dehydrated onions	2.0	2.7
8. Phosphate constituents of raising powders	2.0	2.7
9. Hops and hop concentrate ...	2.0	2.7

FLOUR CHEMICALS

Possible Large Demand for Cl O_2

THE future course of a potentially important section of industrial chemical production, that concerned with high purity chlorine dioxide gas for the flour milling industry, may be determined by current discussions between two Ministries—of Health and Food—and the millers' organisations.

This was indicated in the course of an interview with THE CHEMICAL AGE by an official of Wallace & Tiernan, Ltd., the company which will be very closely identified with providing the type of gas equipment which will be required in substantial quantities when the recommendation to employ as a flour bleaching agent and improver chlorine dioxide, instead of Agene, is implemented (THE CHEMICAL AGE, *62*, 235).

Wallace & Tiernan, Ltd., is in a position to make at once, and probably will be making, 85 per cent of the chlorine dioxide plant needed in this country. Within six to eight months it expects to raise that figure to 100 per cent. Until then, some 15 per cent of the total plant likely to be needed must be imported from America, because a few essential parts and constructional materials are not at the moment readily available here. Some of these are plastics materials, but tests with substitutes over the next few months are thought likely to remedy the small deficiency.

Plastics for machinery parts, although in their infancy, are thought by Wallace & Tiernan, Ltd., to have a promising future.

SYNTHETIC FILAMENTS

U.K. Technology for Australia

FOLLOWING the recent announcement of the formation of a new company, Courtaulds (Australia), Ltd., is a statement by Courtaulds, Ltd., that the Australian company has decided to locate both its factories near Tomago, New South Wales. They should be built by the end of 1953 and are estimated to cost from £A5-6 million.

One factory is planned to produce approximately 6 million lb. per annum of high tenacity. continuous filament viscose rayon yarn. For strategic and economic reasons, the Australian Government is said to attach great importance to the establishment of a factory for producing this yarn.

The other factory is to produce some 3 million lb. a year of acetate textile yarn.

20-Year Agreement

Apart from its shareholdings, Courtaulds will be associated with the Australian company under the terms of an agreement intended to continue for a minimum of 20 years. Courtaulds, Ltd., is to provide designs for the factories and supervise their construction and to assist the company to procure and install plant and machinery and to select and train key personnel.

The British company will also make available technical data and patent rights. The agreement does not cover nylon yarn.

Courtaulds has agreed that as soon as satisfactory arrangements can be made the new company will be appointed as sole agents in Australia for certain products.

It is hoped that Courtaulds (Australia), Ltd., will ultimately be able to obtain its cellulose requirements from indigenous Australian sources. Any dollar expenditure incurred by importing cellulose should be more than balanced by the saving in dollar purchases of tyre yarn and tyre fabric. Sulphuric acid, carbon bisulphide and caustic soda will, it is expected, be available from Australian sources.

Cellulose acetate flake and acetone, the main raw materials of acetate yarn, should both be available in Australia.

The outstanding performance of viscose tyre yarn during the war has established it as an industrial textile fibre of great importance. World production (excluding Germany, Italy and Japan) of viscose rayon yarn for industrial purposes is believed to have risen from about 10 million lb. in 1939 to 380 million lb. in 1948.

INDIAN CHEMICAL POLICY

Potassium Permanganate Dispute

INDIA'S demand for potassium permanganate has been estimated at about 200 tons per annum during the next three years.

The country's home production of the chemical is believed not greatly to exceed the 1946 figure of 20 tons per annum.

Protection of the industry is due to end on March 31 and, recently, the views of producers, consumers and importers of potassium permanganate were sought by the Indian Tariff Board.

The manufacturers, who stated that a new plant designed to produce 150 tons a year would soon be installed, criticised the open general licence policy of the Government as preventing the disposal of the indigenous products.

Importers urged that protection should be lifted, since the home industry could meet only a small part of the country's needs.

The manufacturers suggested that the protective duty should be continued to give the industry the opportunity to increase its capacity.

Sulphate of Ammonia

Sixty-eight thousand tons, more than one-third of the total quantity of sulphate of ammonia available in India, has been allocated to the country's tea, coffee, jute and cotton industries during the year, July, 1949, to June, 1950.

The quantities allocated are: tea 30,000 tons; coffee 5000 tons; jute 15,000 tons; and cotton 10,000 tons. In addition, 8000 tons has been directed to the United Planters' Association of South India and 8000 tons to other industries. About 124,000 tons has also been allocated to the Provincial and State Governments for use in the food growing industries.

Norway's Nitrate Fertilisers

WITH the full operation of Norsk Hydro's recently completed factory at Glomfjord, in Northern Norway, the company's capacity has increased to 150,000 tons of nitrogen a year. This is used to manufacture 1 million tons of nitrate fertilisers, the company's main product. Norsk Hydro's output is valued at £11 million a year, of which £9 million is earned from exports. Although the cost of raw materials is low, Norsk Hydro disposes of 400,000 kW of electric power a year.

In recent years the company has invested some £12 million in new plant.

THE UNIVERSITIES AND INDUSTRY

Need for Flexible Policy to Meet Changing Conditions

by Dr. W. H. GARRETT*

OUR friends who have studied natural history tell us that through the ages it is the adaptable animal that survives. We should, therefore, while preserving all that is really worth while in our traditions, prepare to meet rapidly changing conditions by increasing the flexibility of institutions.

This, I feel, can best be done by increased mutual support between the universities and industry, based on closer contact, a regular channel of information, and a joint policy-making body which will enable both industry and the universities to exploit more fully their potentialities.

The subject of relationship between universities and industry in this country is one which is of great interest to me and one which becomes more and more important as time passes and our civilisation becomes increasingly complex and competitive.

The manifold industrial advantages which this country possessed in the nineteenth century have been, in the main, overtaken by rapid advances in other countries. In fact, when the four corners of the world come armed to-day with their industrial developments, there is little we can do to shock them.

The times in which we live enforce a speeding up in our industrial tempo and a more rapid translation of ideas into practice. What I have to say largely applies to the chemical industry, widely defined, and the corresponding university faculties.

Effect on Universities

At one time, when university-trained men founded a struggling chemical industry, this was regarded by many as a profanation of the true spirit of science. Later in the 19th century, however, it was realised that without a continuous flow of new discovery the industry could only stagnate. No industrial research organisations existed at that time, and the essential impetus could only come from the universities.

Danger then arose that universities, under the pressure of industrial expansion, would concentrate on specific training rather than on real education, *i.e.*, on teaching the brain to work thoroughly on certain narrow lines instead of training the mind to think for itself.

With all the modern facilities that exist in the U.S.A. to-day, this very danger is at present a serious threat to American university life. In this country there have been continuous efforts to strike the right balance, and this danger is passed.

New Sources

What is the position to-day? With the development of the Department of Scientific and Industrial Research, the various trade research associations, and the research groups of individual companies, there is reasonable cover for the specific technical problems of industry.

Indeed, to a certain extent, some of these organisations supplement the pure research which is one of the prime functions of the university faculties.

We have too, a growing realisation on the part of industry that financial support of the work of the universities is a sound and, indeed, necessary investment if industry is to advance.

True, not all industrial concerns yet see the wisdom of giving such support unconditionally, but the number that do so is increasing annually. The extent of this support to-day is indicated by the Nuffield Trust, the I.C.I. fellowships, etc. We also to-day have a much closer contact between universities and industry in the placing of graduates in employment.

All these are excellent things, but possibly the fundamental necessity is still, to a large extent, neglected. There is no recognised and regular flow of information from industry to the universities concerning the forward picture, the technical and economic trends of industry, with the result that the equipment of graduates entering industry is incomplete.

In the worst case there may be a glut of one type of graduate and a shortage of other types, caused by changes in industrial techniques.

By the time a student graduates he has made up his mind, aided by his tutors, which of the three main lines he intends to follow—academic, pure research or industrial. I would like to emphasise here the serious responsibility that lies on the

* Abstract of an address given to the University of Liverpool Chemical Society at Liverpool University on February 23, by the director of production of Monsanto Chemicals, Ltd.

university faculty in guiding the student into the line for which he is best suited.

The chemical industry in this country has suffered considerably through making first-class research men into second-rate managers. The industry and the country require all our high grade research ability to be employed in its most fruitful sphere.

For the first and second types of career, academic and pure research, the universities and associated training colleges provide excellent post-graduate tuition, but it does not appear to have been realised that for the man taking up an industrial career there are many other things to learn beside the fundamentals of his particular branch of science.

Post-Graduate Training

Usually, graduates leaving the university to enter industry know little or nothing of the principles of management, of factory economics and costing, or of industrial relations. The terms "depreciation," "amortisation," etc., are still a foreign language, yet normally the future leaders of industry will be chosen from these graduates.

Manpower is unlike the raw materials handled in the laboratory, in that it is variable and often unpredictable in behaviour. The economic use of manpower which, to a large extent, depends on a knowledge of the principles of good management and industrial relations, ranks high among the important factors of industry to-day.

It may take ten years of training in industry itself before it becomes apparent that a graduate can be useful in a higher post. These factors apply not only to the production chemist, but equally to the chemical and the mechanical engineer, the man on applied research and development, and the technical representative.

University Courses

True, some firms carry out a form of training along these lines, but only the largest companies can carry the necessary organisation. Even where such training exists, it is almost certain to be unconsciously biased along the lines of policy and practice of the particular concern.

I think there is no doubt that general training along these lines could best be given by suitable post-graduate courses in the universities. Most science graduates in industry to-day would, I think, rate very highly the value of such a post-graduate course in management training, factory costing and industrial relations, had it been available.

The shortage of suitable lecturers may be a major difficulty in the way of starting such courses, but in American universities this obstacle was overcome in the early years by co-operation with industry, which provided visiting lecturers from high-level executives. Such an arrangement should not be impossible in this country.

A second suggestion worthy of consideration is the possibility that industry could employ for periods of, say, a year, members of university faculties on Sabbatic leave.

Provided that the faculty members were employed by industry in posts and on work which would expand their experience in the right fields, much could be gained by both sides.

A third suggestion arises from this, that industry should make a regular practice of sending members of industrial technical staff back to universities for refresher courses. This is widely done in the U.S.A. at industry's expense and has proved to be a good investment.

Channelling of Information

This idea, if carried out, would not only help in the regular channelling of industrial information to the universities, but if they make the fullest use of these refresher students, the advantage to both sides would be well worth while.

How, then, can this close and continuous contact between the universities and industry be set up and maintained? Would it not be possible to set up a small liaison committee for each major industry, made up of leading men of that industry and representatives of the university faculties responsible for the studies appropriate to that industry?

Such a group, meeting twice a year, could do much towards improving our competitive industrial position in the world.

Members of such a committee on both sides would need to be men of broad view, progressive outlook and able to think ahead on the long term. By knowledge of world conditions and of the industry concerned, combined with information on technical advances, they could reasonably forecast requirements of that particular industry for five or ten years ahead.

Industry would have to be prepared to bear its share in any extra financial burden that such a flexible policy might lay on the universities, but the results obtained should well repay such support.

CHEMICAL EXPORTS NEARLY £8m.

Fluctuations in January's Trade

EXPORTS of chemicals, drugs, dyes and colours in January reached a total of £7,934,581. That, although slightly below the total for the same period of 1949, was £1,177,994 more than in January 1948. (THE CHEMICAL AGE, 62, 285).

Among the larger export increases (compared with last year) were copper sulphate 2046 tons (1469); caustic soda 252,357 cwt. (140,695); sodium sulphate 73,785 cwt. (43,795). Marked decreases included bleaching powder, collodion cotton, sodium carbonate and tar oil, creosote oil, etc. A few minor items (formic acid, aluminium oxide) have been omitted in the course of the periodical revision of the *Trade and Navigation Accounts of the United Kingdom* as they are no longer considered to justify individual mention.

Devaluation had its affect upon the value of imports, notably in carbon blacks from natural gases, the total quantity for January 1950 being 98,039 cwt. (or only 17,210 cwt. more than the previous year) whereas the value was £400,927 compared with £254,236.

EXPORTS

	Jan. 1950	Jan. 1949
Cresylic acid	Gal. 267,255	Gal. 115,819
Salicylic acid and salicylates	lb. 166,050	lb. 177,772
Value of all other sorts of acid	£171,570	£112,542
Sulphate of alumina	Tons 2,589	Tons 3,902
All other sorts of alumium compounds	3,136	298
Ammonium sulphate	29,730	28,868
Ammonium nitrate	4,535	8,150
All other sorts of ammonium compounds	1,868	1,366
Bleaching powder	Cwt. 24,233	Cwt. 61,902
All other bleaching materials	8,537	7,191
Collodion cotton	1,889	2,811
Copper sulphate	Tons 2,046	Tons 1,469
Disinfectants, insecticides, etc.	Cwt. 29,404	Cwt. 34,415
Fertilisers	Tons 2,101	Tons 5,626
Value of gases (compressed, liquefied or solidified)	£26,336	£28,910
Lead, acetate, litharge, red lead, etc.	Cwt. 8,043	Cwt. 10,433
Tetra-ethyl lead	Gal. 131,130	Gal. 99,001
Magnesium compounds	Tons 1,028	Tons 791
Nickel salts	Cwt. 6,250	Cwt. 6,576
Potassium compounds	5,385	7,579
Salt	Tons 21,776	Tons 14,844
Sodium carbonate	Cwt. 275,399	Cwt. 447,300
Caustic soda	252,357	140,695
Sodium silicate	19,293	36,230
Sodium sulphate	73,785	43,795
All other sodium compounds	75,153	81,004
Tar oil, creosote oil, anthracene oil, etc.	Gal. 2,831,731	Gal. 4,938,489
Zinc oxide	Tons 827	Tons 819
Total value of chemical manufactures (excluding drugs and dyestuffs)	£4,308,214	£4,280,789
Quinine and quinine salts	£43,738	£62,469
Acetyl-salicyclic acid	Lb. 266,161	Lb. 223,031
Insulin	100 International units 1,208,017 Mega Units	100 International units 1,470,544 Mega units
Penicillin	1,018,497	362,955
Total value of drugs, medicines and preparations	£1,756,256	£1,594,471
Total value of dyes and dyestuffs	£746,899	£1,051,969
Total value of paints, pigments, colours, etc.	£1,123,212	£1,285,541
Plastic materials	Cwt. 52,235	Cwt. 36,726
Value	£657,205	£497,384
Chemical glassware	Cwt. 1,490	Cwt. 1,691
Value	£57,105	£54,831
Fans	Cwt. 6,596	Cwt. 5,752
Value	£178,378	£154,216
Furnace plant	Cwt. 6,161	Cwt. 7,676
Value	£111,043	£86,120
Gas and chemical machinery	Cwt. 32,135	Cwt. 26,108
Value	£380,508	£293,276

IMPORTS

	Jan. 1950	Jan. 1949
Acetic anhydride	Cwt. —	Cwt. 7,364
Acetic acid	—	—
Boric acid	10,550	900
Carbolic acid	—	8,168
Value of all other sorts of acid	£80,973	£30,863
Borax	Cwt. 28,440	Cwt. 6,056
Calcium carbide	—	38,009
Cobalt oxides	537	402
Fertilisers	Tons 11,045	Tons 9,721
Glycol ethers and glycol ether esters	Lb. 182,038	Lb. 399,224
Iodine	16,000	66,050
Potassium chloride	Cwt. 573,416	Cwt. 280,635
Potassium sulphate	27,760	29,560
All other potassium compounds	6,444	13,358
Sodium nitrate	—	—
All other sodium compounds	4,323	4,322
Carbon blacks (from natural gas)	98,039	80,829
Value of carbon blacks	£400,927	£254,236
Total value of chemicals, drugs, dyes, and colours	£2,609,934	£2,175,503
Sulphur	Tons 32,285	Tons 31,281
Value	£307,197	£261,779
Gas and chemical machinery	Cwt. 2,721	Cwt. 1,014
Value	£95,112	£22,965

MECHANICAL SEAL DESIGN

Problems of Wear and Materials

PROVISION of a pressure-tight seal round a rotating shaft is not easily procured, particularly where the sealing of fluids and gases in pumping mechanisms is essential.

Mechanical seals must, therefore, be designed to perform efficiently despite the gradual deterioration of operating conditions. Problems affecting these designs are discussed in a booklet now available from Crane Packing, Ltd., Slough, from which the following abstracts are taken.

Three principal considerations influence the performance of a mechanical seal: shaft condition—it is necessary to absorb movement of the shaft or mis-alignment of the fixed seal ring against which the seal face rotates; materials—materials used in the construction of a seal must be capable of withstanding the effect of any fluids with which they are in contact; wear—obviously the degree of wear which is imparted to the seal face and the seal ring will determine the length of life of the seal unit.

Minimum Flexibility

So far as flexibility is concerned, any mechanical seal must have a degree of flexibility which will compensate for movement or mal-alignment up to at least .125 in. free axial float, .010 in. eccentricity or whip of the shaft, and up to 1° of mal-alignment for the fixed seal ring; a leak-proof seal is generally contrived through the medium of two opposing faces, one of which—the seal face proper—rotates with the shaft in such fine contact with the other (the fixed seal ring) that leakage between the faces is impossible, either when rotating or when standing.

A seal which lacks flexibility will cease to operate efficiently when the two faces are disturbed by the type of unfavourable shaft conditions referred to above, or other influences associated with the type of service or pressures involved. It has been established that the incorporation of a rubber flexible member, either in the form of a bellows, or a U-sectioned rubber ring is the most satisfactory method of imparting the right degree of flexibility.

The materials which are used for the various components in a seal unit assembly must be selected carefully, due consideration being given to the service upon which the seal is to be used. The effect of various fluids which are of a corrosive nature on various metals is a factor about which there is ample information to enable the designer to select the most suitable metal for any particular application. Other components of the seal assembly which are of a non-metallic character present some difficulty when the conditions under which the seal is to operate are exceptionally severe, but experience has established that there are two types of rubber—synthetic and natural—which cover most applications.

Experience indicates that in this application the expectation of life, relative to temperature, is approximately 33 per cent better in the case of the synthetic rubber than of the natural product.

The third consideration, and one which has necessitated a considerable amount of research and experiment, is that of wear, which takes place through the two faces rubbing together without any form of lubrication. Little can be done to control the rubbing speed of the seal faces, which is normally expressed in surface feet per minute on the mean diameter of the faces.

The seal faces must, in modern practice, withstand rubbing speeds up to 2000 surface feet per minute, and possibly above this speed, with special arrangements to disperse the heat generated. In order to keep down the surface speed, the seal face diameter must be kept as small as possible, although in certain instances there must be exceptions to this rule where factors of greater importance have to be considered. For example: thrust—applied by two forces—the spring and the pressure against which the seal is holding. The lighter the spring loading, the less wear takes place at the seal faces, but the loading cannot be reduced very much.

Balance

Experiments have proved that 10 per cent out of balance—i.e., 90 per cent balance—is the ideal for high-pressure work (150 to 500 p.s.i.) and 50 per cent for medium pressures (up to 150 p.s.i.), the effect on life due to the loading in the latter case being negligible. Where the surface rubbing speed is comparatively low and the face diameter small, as with seals up to 1⅛ in. size, it is not necessary to use 90 per cent balanced faces even at pressures up to 300 lb., which is their maximum. Balanced faces are not generally manufactured for seal sizes under 1¼ in.

BEHAVIOUR OF SELECTIVE WEED KILLERS

*Largely Increased Toxicity of Oil Solutions**

ON the basis of American results† dinitro-butylphenol holds out considerable promise for the control of annual weeds in peas, so for some of the initial experiments mustard and peas were chosen as representing susceptible and resistant types.

Some pots of each species were sprayed with varying concentrations in water of both compounds and others were sprayed with solutions to which 10 per cent of groundnut oil had been added and emulsified, because on theoretical grounds it was thought that the oil would increase the rate of penetration.

Immediately after spraying, the shoots from some pots were taken and the amounts of water and water-oil emulsion retained on the shoots measured. The remainder of the pots were left and counts eventually made to determine by analysis the respective concentrations which killed half the plants.

Taking first the effect of adding the oil, the results are remarkably consistent. With peas, the oil addition increased the toxic action of both compounds by ten times, while the corresponding, although less accurate, factors for mustard were of the same order.

Differing Retention

Since the oil emulsion alone had little effect, one could draw the conclusion that the oil caused an equal increase in the rate of penetration in both mustard and peas, but this leaves out of account the possibility that the retention of the emulsion might be different from that of the water spray. Indeed, it was found that, while with mustard there was no difference in retention by the shoot, the peas retained three times as much of the oil emulsion.

The final conclusion therefore reached is that with peas the increase in toxicity is a question of retention and penetration, while for mustard it is largely a question of penetration.

Now, these results raise a general point in relation to the formulation of herbicides. Some compounds are insoluble or only sparingly soluble in water and it may be commercially convenient to dissolve them in some other solvent than water, but if such a procedure is adopted the effect of the solvent must be borne in mind. For example, the esters of the growth regulating substances are insoluble in water but soluble in oil and they are normally marketed as oil emulsions.

Statements are frequently made that the esters are more toxic than the sodium salt and some of these claims leave out of account the effect of the oil emulsion in increasing penetration or spray retention. The overall effects of the ester oil emulsion may operate to make the treatment more or less selective than aqueous solutions of the sodium salt, since a greater retention is tantamount to increasing the concentration.

Comparison of Solutions

Another example of the complexities inherent in formulation relates to ammonium dinitro-butyl-phenate and some organic solvents. As part of the investigations on penetration, aqueous solutions have been compared with solutions made up by adding the nitro-phenate dissolved in ethyl alcohol to water, so that the final spray fluid contained 1—6 per cent alcohol.

It was found that the alcohol dilutions were appreciably more toxic to peas. This increase was not recorded where the solvent was acetone or when the equivalent quantity of alcohol was added to the fully diluted spray.

Returning to the experiment on the mustard and peas there remains the question of the relative toxicity of the two nitro-compounds, and here is one of those "Looking Glass" answers which make new techniques of weed control possible. In the case of the mustard, the dinitro-butyl-phenol was over four times as toxic as dinitro-ortho-cresol but it was only 0.55 times as toxic to peas. In other words, the dinitro-butyl-phenol was eight times more selective.

Roberts, in his field investigations with peas, has found that, according to the species of annual weed, the dinitro-butyl-phenol is one to four times as toxic as dinitro-cresol.

In seeking to determine the concentration of the ammonium dinitro-butyl-phenate which has the greatest selectivity in peas, a new problem has arisen, since it appears that pea varieties differ in their liability to injury.

* Abstract from the paper, "Selective Toxicity and the Development of Selective Weedkillers," presented by G. E. Blackman, before the Royal Society of Arts, March 1.

† K. C. Barrons and B. H. Grigsby (1945), Mich. Agric. Exp. Stn. *Q. Bulletin*. **28**, 145.

FRENCH SCIENTIFIC INSTRUMENTS

Impressions of the London Exhibition

by FRANK GREENAWAY, M.A., F.R.I.C.

NOT often is there the chance of seeing how our friends and neighbours on the Continent are tackling current scientific problems, so that the London Exhibition of French Scientific Instruments, at the Science Museum, Kensington, has helped to repair a regrettable gap, as well as fostering mutual understanding.

The exhibition, conceived by members of the French colony in London and sponsored by the Cultural and Commercial Counsellors to the French Embassy, owed to the ready co-operation of the Science Museum the advantage of presentation in just the right setting.

Franco-British Co-operation

M. Jean de Sailly, Commercial Counsellor to the French Embassy, when he opened the exhibition on February 8, presented the highly acceptable view that co-operation in every sphere between France and Great Britain is the first essential for a settled Europe. Understanding being the first step to co-operation, this exhibition had a significant contribution to make.

At the same ceremony Prof. E. N. da C. Andrade expressed his pleasure that new departures in science should see no break in the great French instrumental tradition of elegance combined with aptness for purpose.

The exhibition has also been the occasion for a series of lectures by distinguished French men of science, the first being of particular interest. On the opening day Prof. Edmund Bauer, professor of physical chemistry at the University of Paris, and M. Volkringer, head of the Patents and Inventions Service of the Centre National de la Recherche Scientifique (CNRS) gave an account of State-aided research in France at the present time.

The long cultural history of France has always been marked by a balance between practical pursuits and the humanities, and the tradition has been preserved from the foundation of the Collège de France in the 16th Century, through the setting up of the Paris Observatory and the Académie des Sciences in the 17th Century, through the foundation, after the Revolution, of the Grandes Ecoles for higher technological studies, to the present day.

With the coming of the era of expensive research French government support was not equal to its responsibilities, except for a brief period in the First World War, until 1939, when the CNRS emerged as a leading force in French science. An autonomous body within the Ministry of Education, it has several laboratories, provides specialised services such as a breeding-station for experimental animals, documentation services and a patents service. The latter is a new body, with a limited budget, but already it is providing advice and financial help for the development of some of the 400 inventions a year—from the CNRS, from other organisations or from independent inventors. All research workers in France may look to the CNRS for support, and that support is not confined to natural science but extends to research in the human studies, philosophy, economics and other subjects.

There exist also in France other research organisations, large and small, none exactly equivalent to our own range of Government establishments but often resembling them in particulars. The chief are the Commissariat à l'Energie Atomique and the Office National d'Etudes et de Recherches Aeronautiques. These, with the CNRS, occupied some three-quarters of the space at the exhibition, the rest being devoted to products of the French instrument industry.

Differential Polarograph

Naturally the physical point of view predominated, but there was sufficient of chemical significance to enable one to judge fairly well the high points of French achievement. The differential polarograph shown by the Commissariat à l'Energie Atomique aroused a good deal of interest among visitors. It gives the first derivative of the usual polarographic curve, so that stationary points are rendered as peaks. The polarographic current flows through a resistance which is connected in parallel with a resistance-capacity galvanometer circuit. The polarisation potentiometer is geared to a synchronous motor so that the potential applied to the cell increases linearly with time.

Neighbouring this equipment was a neat stand and thermostat for polarographic work in which cells can be changed with

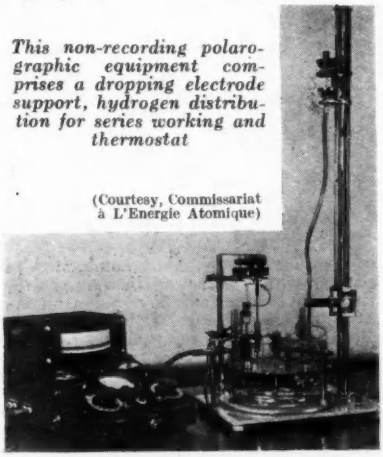
case and speed. Equally elegant is the little lathe for forming spectrographic electrodes, also shown by CEA. At the other extreme of size is the mass spectrograph for routine analysis of mixtures in the atomic weight range 4 to 60.

The ions are accelerated by a d.c. potential on which can be impressed a variable a.c. component. The masses thus scan a receiving slit and give pulses in the output, which, after amplification, are registered on a cathode-ray screen. The section of the range covered by the display is determined by the a.c. component of the accelerating voltage.

Gas analysis figured also on the stand of the Office National des Etudes et de Recherches Aeronautiques. The analyser's operation depends on the selective absorption of infra-red radiation by gases. An infra-red beam traverses first the mixture to be analysed and then a tube containing a known quantity of the gas to be detected. The gas in the second tube is heated by the radiation it absorbs. The volume of the given gas in the first tube determines the absorption of radiation and regulates the radiation transmitted to heat the second tube. The heating is recorded through a pressure charge affecting the capacity of an electrical condenser. Very small concentrations of particular species can be detected and automatic recording can be provided.

Spectroscopy has always been faced with the lack of materials of perfect transparency. Some natural crystals have useful properties, such as rock salt, which is transparent to wave lengths beyond 10 microns, but large, flaw-free samples are excessively rare. ONERA is now producing large masses (up to 20 kg. in weight) of synthetic crystals by the slow annealing of melts. Sodium chloride, potassium chloride and bromide, sodium nitrate and silver chloride have all been successfully prepared in this form.

There is some equipment of metallurgical interest. ONERA showed a Durometer in which eddy currents induced in a test sample are used to indicate the conductivity of a metal and so give a measure of those mechanical properties which are related to it, notably hardness. In the industrial section is to be seen the microsclerometer made by the Société d'Ajustage et de Mécanique de Précision. This determines Vickers hardness without removal of the sample from the microscope and very light loads can be applied for the study of micro-constituents.



This non-recording polarographic equipment comprises a dropping electrode support, hydrogen distribution for series working and thermostat

(Courtesy, Commissariat à L'Energie Atomique)

Cathode-Ray Recorder

Electrolytic polishing is being studied at the Sorbonne and the usefulness of direct records of current-voltage and resistance-voltage curves in such work has led the CNRS to design a cathode-ray recorder, in which the horizontal plates receive a voltage proportional to the voltage at the electrodes of the cell, while the vertical plates receive a voltage proportional to the apparent resistance of the cell. Visual observation facilitates direct control, while photographic recording allows quantitative records to be made.

This is a small proportion of the instruments of chemical interest shown and a still smaller proportion of the whole exhibition. General impressions, however, are valid here, and one can say that these French instruments reach very high standards of utility, robustness and appearance.

We do not seem at the moment to have a great deal to learn from the French in the sphere of chemical instrumentation, but we must be careful not to be too dogmatic on the basis of one exhibition, largely physical.

Since the end of the war, French instrument makers have had much leeway to make up; they have had to establish style as well as technique; they have often had to make up in enthusiasm what they lacked in resources.

Those of us who have been fortunate enough to meet the French technicians who came over will agree on one thing. The younger generation of instruments designers and research workers in France have a pride in their work which we should do well to match.

DRUGS AND FINE CHEMICALS IN 1949—IV

Antihistaminics and Motion Sickness

By G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

METHODS by which histamine might be rendered harmless to the tissues have been given a great deal of consideration and attempts made to create an antibody-promoting mechanism. One such compound was developed to produce artificial immunity by coupling *p*-aminobenzoylhistamine with a non-sensitising protein. Histamine was condensed with *p*-nitrobenzoyl chloride in hot chloroform/ether solution to yield imidazolylethy-*p*-nitrobenzene which was reduced to the corresponding amino compound and then diazotised. The diazonium compound was then coupled with the selected non-sensitising protein (egg albumin, etc.) at *p*H 8.1 (B.P. 562, 169).

The value of such histamineazo protein complexes is, however, open to some doubt. Symptoms of allergy have also been relieved by the use of adrenaline, ephedrine and aminophylline which have a pharmacological effect which is essentially opposite to that of histamine in certain relevant particulars. The only really effective treatment of allergic conditions, however, is based on the use of immunising injections of a specific antigen. This is not surprising since the approach is a basic one.

A recent summary of present knowledge of immunochemistry has been made during the past twelve months by Sexton ("Chemical Constitution and Biological Action," p. 377, E. and N. Spon, 1949).

This approach is based on the fact that an individual who might be the subject of an allergy is so because he has become sensitised to the allergen (or antigen) and, as a consequence, his tissues contain specific antibodies. When contact is again made with the allergen, this is believed to combine with the antibodies already present in the tissues. One effect is the liberation of free histamine which exerts one or more of its pharmaceutical effects with all the manifestations of an allergic flare-up.

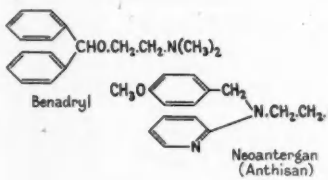
Desentisation to the specific allergen may be achieved by injection of the allergen from a certain minimum figure in increasing dosage. The antigen may be, for example, a sulphonamide drug where sulphonamide sensitivity exists; or it may be a pollen in the case of some asthmas and hay fever. Tate and Klorfajn (*Lancet*, 1944, *i*, 406) have summarised the mechanism of such desentising action by the use of the Law of Mass Action.

However, this basic desensitising treatment may be a tedious and prolonged one. A primary difficulty, and one that is often insuperable, is to identify the responsible allergen.

For some decades, therefore, a line of thought has been pursued in the hope that some non-toxic drug might be found which, structurally related to histamine, might compete with freed histamine at the site of an allergic reaction for the effective surface of a hypothetical receptor substance. Here we see implied the presumed mechanism of drug antagonism.

This line of attack was initiated by Bovet in France, who discovered substances with antihistamine action, while searching for anti-adrenaline substances.

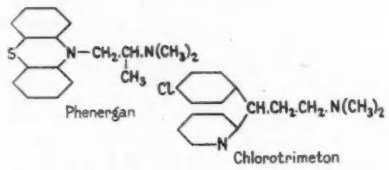
About 1932, Fourneau, Mesnier and Staub also shared in advances in this field. After a series of disappointments due to the high toxicity of the drugs tested the first satisfactory antihistaminic drug to be made available was Antergan, which was soon replaced by the more potent and less toxic Neoantergan (Anthisan) which is N-p-methoxy-benzyl-N-dimethylaminomethyl-α-aminopyridine:—



Neoantergan, it should be understood, in common with all other antihistamine drugs which have followed, is a palliative and rarely effects any cure of the fundamental allergy. In a sense, there is a relapse which has already been noted to occur when cortisone therapy in rheumatoid arthritis or ACTH therapy in asthma is stopped. It is not to be inferred from these remarks, however, that there is, therefore, a common mechanism.

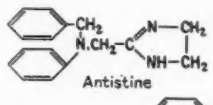
Concurrently with the developments leading to the production of neoantergan in France, similar work in the United States led to the development of Benadryl (the dimethylaminomethyl ether of benzhydryl) and Pyribenzamine, which is identical with neoantergan, except that the former is lacking the methoxyl group.

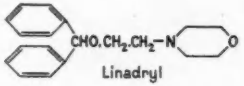
These compounds are derivatives of ethylenediamine as is Phenergan, a product of Halpern's researches. A departure from the ethylenediamine series is chlorotrimeton, in which the ethylenediamine residue is replaced by n-propylamine.



The pharmacological effectiveness of these drugs is approximately in the order: benadryl, pyribenzamine chlorotrimeton and phenergan.

There are certain basic features in the structure of these antihistaminics. The more potent compounds possess the ethanolamine or ethylenediamine structure and, for high potency, the chain should carry a tertiary nitrogen atom. However, the nitrogen atom may be incorporated in a heterocycle as in Antistine (N^1-phenyl-N^1-benzylaminomethylimidazoline) or in Linadryl (the morpholino-analogue of benadryl).





Dimethylamine derivatives are considerably less toxic than diethylamine derivatives.

Increasing length of chain, as well as branching, leads to loss of activity. An exception to this lies in the phenothiazine-isopropylamine derivative phenergan.

Modification of the aromatic rings attached to the alpha nitrogen atom (or to the other linkage—as in benadryl) leads to decrease in activity. The introduction of p-methoxy into the benzyl group often leads to an increase in activity. Substitution of the benzyl group by thenyl or halogenated thenyl does not affect activity. (*J. Amer. Pharm. Ass., Sc. Edit.*, 1948, *37* (10), 383). A report to the Council on Pharmacy and Chemistry of the American Medical Association by Feinberg is also of value (*J. Amer. Med. Ass.*, 1946, *132* (12), 703) but much progress has been made in the development of new antihistaminics and in clinical assessment since the date of this report.

During the past twelve months or so two interesting developments in the field of antihistaminics have taken place.

The first has been in the field of motion sickness. The cause of motion sickness, however caused, is unknown, but the labyrinth is believed strongly to be involved. Many remedies have been recommended, but on the whole they have proved of little value.

In 1944, Holling et al (*Lancet*, 1944, *i*, 127) found that only preparations containing belladonna alkaloids had any effect. Numerous subsequent tests, many undertaken to control seasickness during the various sea-borne invasions during the war, have confirmed that the belladonna alkaloid, hyoscine (with or without lævo-hyoscyamine) controlled 50-60 per cent of the cases of motion sickness when administered in doses of 0.6 mg. At this level of dosage, side-effects were comparatively negligible.

During 1949, Gay and Carliner (*Science*, 1949, *109*, 359) reported that, in 1947, the antihistaminic "Dramamine" (β-dimethylamino-ethylbenzhydryl ether of 8-chlorotheophylinate) was submitted by the manufacturer to the Allergy Clinic of the Johns Hopkins Hospital in cases of allergic urticaria and hay fever. The drug was administered to a pregnant woman suffering from urticaria who, all her life, had suffered from motion sickness in street cars. Remarkably, not only was the urticaria relieved but so, also, was the car-sickness.

Confirmatory conclusions have also been reached, showing that dramamine will prevent seasickness in one hour (100 mg. dose); and reduce airsickness (Strickland and Hahn (*Science*, 1949, *109*, 356).

McEvedy (*Lancet*, 1949, *i*, 825) noted that, in 1947, patients treated on board ship with antihistaminic drugs avoided sea sickness. Subsequently he was able to show that anthisan (pyrinisamine maleate; N^1-p-methoxybenzyl N^1-pyridyl - N - dimethylethylenediamine) was at least as effective as hyoscine in controlling sea sickness.

(*To be continued*)

Metallurgical Section

4 March 1950

ULTRASONIC TESTING OF WELDS

Basis of Large-Scale Employment in Wales

The application of ultrasonic techniques to testing welds was described and demonstrated at a recent conference of the British Welding Research Association. The paper, from which this article is abstracted, was the result of collaboration between Mr. W. S. Atkins and Mr. E. F. Lewis, describing results of experimental work at the Abbey Works, Port Talbot

ULTRASONIC waves are generated by feeding high frequency current to a quartz crystal which vibrates, converting the electrical motion into ultrasonic wave motion at the same frequency. For most weld testing applications frequencies between 1-5 megacycles are used, *i.e.*, frequencies in the same range as are used for normal broadcasting (wave length of the Home Service of the B.B.C. corresponds roughly to 1 m.c. Circuits similar to those used in radio are used as a source of supply.

The properties of ultrasonic waves are not yet by any means fully understood. Many of the classic equations worked out for waves of audible frequency have been found to apply. Others show a great variance from observed facts at the high frequencies.

However, for the purpose of weld inspection certain properties only are interesting. First, if ultrasonics are generated by a source of finite diameter most of the energy is propagated in a narrow beam—rather like a beam of light from an electric torch. These beams are not parallel and the degree of spread depends on the ratio of the wave length to the diameter of the source. The greater the ratio, the greater the spread.

When a beam of ultrasonic waves meets an interface between two media of different acoustical properties reflection occurs. In the case of two dissimilar isotropic media of great extent the amount of energy reflected is given by the following relationship:—

$$E_r = E_i \left(\frac{R_1 - R_2}{R_1 + R_2} \right)^2$$

Here E_r is the reflected energy, E_i is the incident energy, and R_1 and R_2 are the specific acoustic impedances of the two media. Specific acoustic impedance is the product of wave velocity and density of medium.

This relationship does not hold when the second medium is in the form of a thin sheet (a few wave lengths thick), nor does it hold for small inclusions of one medium in another, but it will serve to illustrate the fundamental underlying principle, *i.e.*, that when the specific acoustic impedances are dissimilar much of the energy is reflected.

It will be seen that if R_1 is great as compared with R_2, nearly all the energy is reflected. On the other hand, when $R_1 = R_2$ the formula indicates that there will be perfect transmission—the materials are said to be acoustically matched.

The following typical values for acoustic impedance will give an idea of the effect: .00004 for air; .14 for water; 4.7 for steel. It will be seen that at a steel-to-air interface the reflection is virtually complete.

Longitudinal, shear and Rayleigh waves are all used for the purpose of flaw detection, but with the techniques which will be described either longitudinal or shear waves are used—the generation of surface waves is generally avoided as they tend to confuse interpretation.

In the use of ultrasonics in weld inspection, the waves are introduced into the steel by means of a vibrating quartz crystal contained in a metal container, the whole assembly being known as a transmitting probe. They are detected by a precisely similar probe and converted into electrical impulses which are then ampli-

Testing a welded structure on the site, the operator directing the beam from the transmitting probe and observing the evidence produced by the echoes on the oscillograph screen

fied and fed to a suitable indicating device, generally, in the case of echo or resonance methods, a cathode-ray oscillograph similar to the ones used for television.

Material conducting ultrasonic waves may affect them in four different ways. Firstly, the material will damp the waves, *i.e.*, there will be internal losses which will dissipate the energy of wave motion. Secondly, since the waves may be propagated as a narrow beam, if there exists a flaw which either absorbs or reflects the ultrasonics, it will cause a shadow. Thirdly, where there is lack of homogeneity, particularly if there is an interface with air on one side, a certain amount of energy will be reflected. Finally, if the thickness of the medium is right, resonance may be set up. All these effects have been used for the detection of flaws in metals.

The first method suffers from the disadvantage that the damping may be due to any number of discontinuities in the path of the beam and there is no way of telling whether there is a single large discontinuity or a large number of small ones, or where they occur along the length of the beam.

The fundamental weakness of the shadow method is that the indication is by non-receipt of ultrasonics, thus one must be absolutely certain that the energy is getting in. In practice the usual method is either to submerge the whole work piece in a tank of water or to keep a constant flow of water or some other coupling liquid between the transmitting and receiving units and the piece. Much work has been done on these lines in Germany, but the snags for weld testing are obvious.

The resonance method is really only suitable as a thickness gauge and will detect laminations, but its use is restricted to this type of flaw.

The echo method was pioneered in this country (following upon the work of Dr. Firestone in the U.S.A.) by D. O. Sproule and his colleagues of the former Henry Hughes Company, working in conjunction with a research committee of the steel industry on the problem of detecting hair line cracks in steel.

This method is, in our opinion, the best and most powerful for weld inspection. Its strong features are that any reflection from the interior of the weld has some significance—a positive signal is used as against the lack of a signal in the shadow method, and that the most minute return signals can be amplified almost to any desired degree.

If a continuous train of ultrasonic waves were propagated into a block of material by a transmitting unit the cone shaped beam would be reflected at the bottom of the block and some would be picked up by the receiving unit. If there is a crack or other discontinuity in the material, then a part of the energy will be reflected from this and picked up by the receiving unit.

Short Cycles

To enable the waves reflected from the flaw to be distinguished from those reflected from the bottom of the test piece it is necessary to send out not a continuous rain, but short pulses of ultrasonic waves between which there are quiescent periods —each silent period being long enough for the proceeding pulse to return from the far boundary to the receiving probe. Thus the waves reflected from the flaw, having a shorter path, will arrive at the receiver sooner than those reflected from the bottom.

If the ultrasonic signals produced by the receiving unit are fed to a cathode-ray tube, so as to produce a vertical deflection of the beam while it is swept horizontally at constant speed by a time base circuit, then the time transmission and receipt of various echoes will be indicated by humps on the trace.

In the practice of weld inspection the beam, instead of being projected normally to the surface, is refracted to make an angle of about 20°. There are three main reasons for the use of a refracted beam in preference to a straight projection.

To obtain the maximum echo a flaw

should lie with its greatest dimension at right angles to the direction of propagation. Most flaws in welds lie roughly in the plane containing the weld seam. It is therefore preferable that the ultrasonic pulse approach from a direcion at right angles to the weld seam.

A reflection is virtually complete at an air-to-metal interface; to transmit the beam from the ultrasonic probe head into the metal a coupling film of oil is used. Thus small irregularities in the surface do not introduce serious loss of energy but the exceedingly rough surface of the weld reinforcement makes transmission through the top of the weld difficult.

The third reason is that the time interval between the emission of the ultrasonic pulse and the return of the first echo where the flaw lies near the surface may become critical; thus the trigger signal and the flow signal may become so close together as to be confused.

In interpreting the echoes, there are three things which may be observed:

(a) The amplitude of the return signal, which may give an indication of the size of the flaw.

(b) The direction from which the echo comes. This may be used to distinguish reflection from a flat surface such as that of a crack and from a curved surface such as that of a slag inclusion. Also it may enable the position of the flaw to be deduced from geometrical considerations.

(c) By timing of the echoes the position of the flaw along the length of the beam can be deduced.

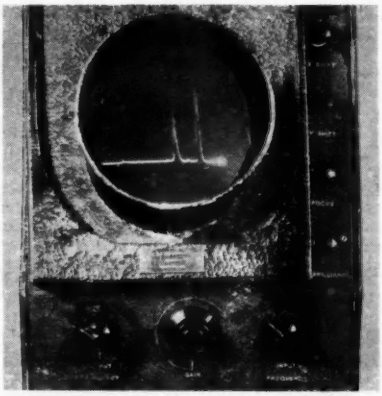
Standard Pieces

Butt welds in heavy girders have been inspected as a matter of routine for the past 15 months. At the commencement we set up standards and in the light of our experience we now feel that you may like to have our views on this important and controversial subject.

We would suggest that an entirely practicable method of setting up standards is to prepare a number of welds of the types to be inspected, each weld containing one type of defect to a predetermined degree. To what extent flaws may be permitted can then be decided either in the light of previous experience assisted by mechanical tests, or the examination of polished sections of the laboratory welds, or by means of radiographs.

The operator can have these standards by him and can by direct comparison determine whether the welds under inspection are equal to, better than, or worse than the laboratory pieces. Where several different types of defects are present in the same weld the question will depend upon the judgement of the engineer in charge, or, alternatively, laboratory samples containing the same types of defects can be made as a guide.

In this work the incorporation of a reject circuit in the amplifier will greatly simplify the task of the operator. This may be set in the laboratory so that flaws which are regarded as acceptable do not show up on the screen.



The oscillograph record of a welded piece, in which the first break in the beam represents a discontinuity in the metal and the second the constant echo received from the bottom of the specimen

Scottish Welding Exhibition

WELDING progress in plant, methods, and testing were demonstrated at an exhibition at the Engineering Centre, Glasgow, opened last week by Sir Andrew M'Cance.

Much improvement had been made in welding and the reliability of welded sheets, said Sir Andrew, but many problems associated with tensile and stainless steels remained. Special test equipment had been provided at its laboratory, Abington, Cambridge, by the British Welding Research Association, which had organised the exhibition.

The importance of welding research and its contribution to productivity were emphasised by Dr. H. Buckley, chief representative in Scotland of the DSIR.

The doctor regretted that out of a potential membership of over 1000 firms, only 200 were so far in the association. Scottish firms, he said, need not feel at a disadvantage because they were distant.

High-Grade Aluminium Chloride

CRL's Route to Improved Powder Product *

ALUMINIUM chloride is a valuable catalyst and is extensively used both by chemical manufacturers and by research chemists, particularly in synthesis work. The commercial product, a hard tooth-like substance—" dog toothed " in the trade—is unsuitable for many chemical applications. Solid materials of this nature present a variety of difficulties and the commercial article may, moreover, contain free chlorine, rendering it unsuitable for use without preliminary treatment and resublimation.

To overcome these difficulties the Chemical Research Laboratory (Department of Scientific and Industrial Research) evolved an apparatus for purifying aluminium chloride, which produced a free-flowing white powder as finely divided as flour.

Process Development

This development originated from an investigation into the synthesis of benzaldehyde as a possible route to toluene, which has been described in a paper by N. D. V. Hardy (J.S.C.I., 1948, vol. 67). This reaction required a high quality aluminium chloride and research was directed to the preparation of a finely divided material which could be more easily handled and could be used in this reaction. The objective was achieved.

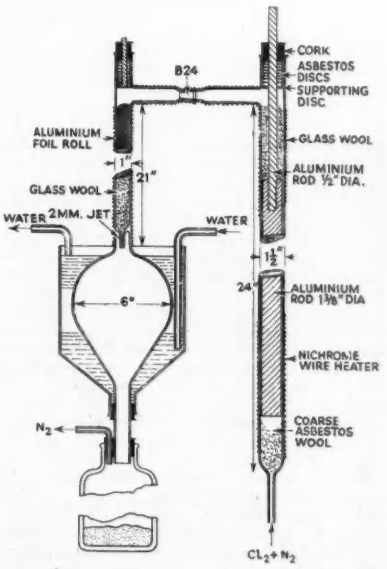
The apparatus was originally used some years ago to purify aluminium chloride prepared in the usual way, but it has now been developed further, so that the preparation of the chloride, its purification and sublimation are all carried out in the same apparatus.

In preparing aluminium chloride from aluminium and chlorine it is difficult to proceed rapidly when using glass apparatus. If the customary practice of using aluminium turnings is adopted, the metal is rapidly raised to incandescence, and hence well above its melting-point of 658.7° C. Accumulation of molten metal cannot be permitted in Pyrex apparatus; it is necessary to conduct the preparation at a sufficiently low rate to avoid melting.

The apparatus now developing aims at dissipating the heat of reaction by presenting the metal in the form of a stout rod so that heat can rapidly be conducted away from the reaction zone. The resulting aluminium chloride vapour is freed from chlorine by passing it over heated aluminium turnings or foil, and is then projected through an orifice into the centre of a water-cooled chamber. Here it is condensed into solid particles before it can reach the cold wall of the chamber, and collects in a free-flowing condition. The product is discharged from the cold chamber into the receiver; its flow is assisted by gentle vibration.

Continuous production is possible only when very pure aluminium is used. The ordinary commercial metal contains appreciable amounts of other metals as well as graphite, and these inevitably lead to difficulty as soon as a sufficient amount of impurities has accumulated to prevent proper functioning of the apparatus.

The apparatus has been used on what might be described as a large laboratory scale and has proved fully efficient. For commercial production further development would naturally be required, but it is considered that the process should be applicable to commercial needs.



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NEW CENTRE OF N-F METAL RESEARCH

Research Association's Advanced Equipment

RECONSTRUCTION of the original laboratory block, which was destroyed by bombing in 1940, has given the British Non-Ferrous Metals Research Association an opportunity to provide itself with facilities for metal studies which it previously lacked.

Laboratories in the new building are devoted to chemistry; physics; mechanical testing (high temperature fatigue and creep, creep of lead, etc.); metal finishing and electroplating; corrosion; metal working and foundry work. There is also a liaison department for testing vitreous enamels in aluminium, etc., and a comprehensive library and information section.

Industries served by the association are numerous, with widely differing plant, process and material problems, and some 37 researches are at present in progress.

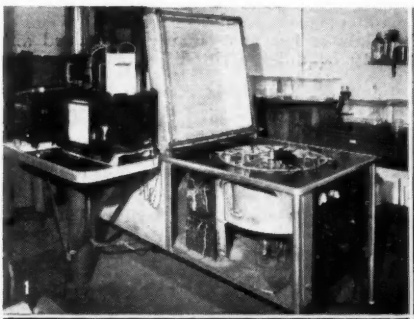
The photographs reproduced below were supplied by the association and show apparatus, all of which was designed and constructed in its workshops.

1.—Apparatus for continuous measurement and recording of electrode potentials of corroding metal specimens or the corrosion current flowing between dissimilar metals immersed in the same solution

2.—The electron diffraction camera used for the identification and examination of corrosion and oxidation products which form thin films on metals

3.—Centrifuge for separation of primary constituents from semi-molten metals. A specimen, contained in a graphite pot, is melted by a small tube furnace and centrifuged at the desired temperature. The e.m.f. from the thermocouple is picked up from contacts at the centre by copper rings

4.—Battery of machines for measuring the resistance to deformation of metals at elevated temperatures (creep). Constant loads of up to 2½ tons can be applied and temperature controlled to ± 0.5° C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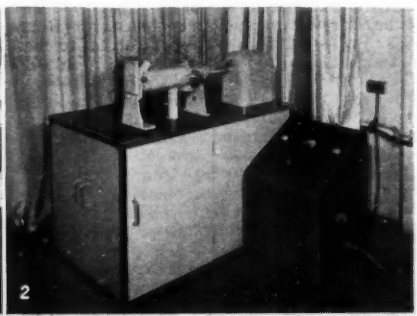
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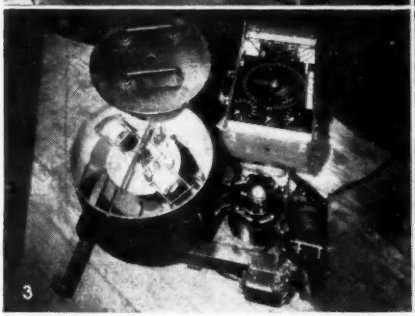
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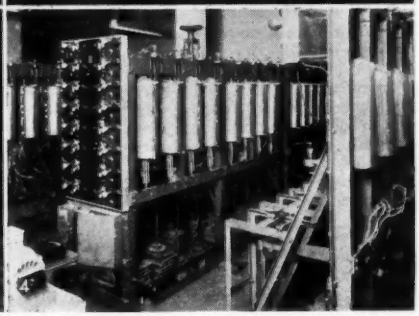
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Breakdown of Copper Water Piping

Some Results of Research into Pitting Corrosion

THE British Non-Ferrous Metals Research Association has for several years been studying the behaviour of copper in supply waters, particularly the pitting type of corrosion which occurs occasionally in certain districts, especially in cold water pipes. The number of pipes affected is extremely small compared with the total quantity in service. Recent work has revealed the main cause of this type of corrosion in cold water pipes, and the following statement has been made for the guidance of manufacturers and users of housing tubes.

Equally Susceptible

This statement is based upon the association's own experimental work coupled with a detailed survey of available service information; it is made with the approval of the committee advising the association on its research on this matter.

There is no evidence to establish the superior corrosion resistance of either of the two grades of copper allowed by the British Standards for light gauge copper tubes for water, gas and sanitation (B.S. 659: 1944) and for copper tubes to be buried underground (B.S. 1386: 1947). The information available suggests that the two materials—phosphorus-deoxidised non-arsenical copper (B.S. 1172: 1944) and phosphorus-deoxidised arsenical copper (B.S. 1174: 1944)—are equally satisfactory in service if both are free from the carbonaceous films referred to below.

There is strong evidence that the pitting corrosion of copper cold water pipes sometimes experienced in certain waters is usually due to the presence of carbonaceous films, which may be produced inside the tubes by some manufacturing conditions.

Pitting corrosion of copper pipes does not occur in the majority of supply waters in this country, even if carbonaceous films are present. There is as yet no clear evidence concerning the effect of carbonaceous or other films, originally present, on the serviceability of copper tubes in hot water systems.

A review of the evidence on which this statement was based is given by the association. This says that two types of corrosion of copper water pipes have been observed. One causes the green staining in baths, wash basins, etc., which is occasionally experienced with waters containing a high proportion of free carbon dioxide. In such cases slight uniform corrosion occurs which does not appreciably reduce the useful life of the pipe. The cupro-solvency test included in the usual water engineers' analysis of a supply water indicates whether the water is liable to give green staining if used with copper tubes.

The other type observed is pitting corrosion. This may cause failure of copper pipes by pinhole leaks, but has only been known to occur in a small number of supply waters in this country. It may occur in either hot or cold pipes but rarely in both with the same water.

Hot water pitting appears to be confined to certain soft moorland waters whereas cold water pitting, which may cause failure in quite short periods, is mainly confined to moderately hard borehole waters, although its incidence bears no apparent relationship to the usual water analyses. Recent research has, however, shown that most supply waters contain a natural inhibitor which prevents pitting; trouble is experienced only in waters containing no inhibitor. The inhibitor has not yet been identified and may be different in different waters.

Failures Analysed

An analysis of 104 failed tubes reported to the association during the last 10 years showed that seven were of tough pitch arsenical copper, 33 of tough pitch non-arsenical copper, 32 of phosphorus deoxidised arsenical copper and 32 of phosphorus deoxidised non-arsenical copper. (The tough pitch copper pipes would not now conform to B.S. 659: 1944 or B.S. 1386: 1947, both of which specify phosphorus deoxidised copper.)

These figures do not give a measure of the probability of failure occurring with a given type of copper. Thus, while at first sight tough pitch arsenical copper appears to be the most satisfactory material, this conclusion is not justified since it is known that comparatively few tough pitch arsenical tubes have been installed.

Owing to the impossibility of obtaining data on the numbers of tubes of each of the types in use in the areas where failures have been observed, the relative merits of the various materials cannot be established by this analysis of failures. It is also impossible because copper pipes may differ in respects more important than composition.

Two cases have been investigated in which both arsenical and non-arsenical deoxidised copper tubes were in the same hot water installation and in which failure occurred in a non-arsenical copper tube. In the first case, failure occurred in the horizontal flow pipe—the position in which failures usually occur in hot water systems—and the arsenical return pipe was slightly pitted. In the second case the arsenical copper pipes were unattacked but it is not definitely known what positions were occupied by the two types of copper.

Following the observation of carbonaceous films in a number of pitted tubes, determinations were made of the amount of carbon in the scale on the previously-mentioned 104 failed tubes and on 17 sound tubes taken from service in areas where pitting has occurred. A close correlation was found between the amount of carbon present and the incidence of pitting in cold water, as shown in the following table.

OCCURRENCE OF CARBON IN COPPER WATER PIPES

Weight of Carbon, mgs/sq. dm.*	Cold water pipes		Hot water pipes	
	Pitted	Unpitted	Pitted	Unpitted
Less than 1.0 ...	7	12	3	1
1.0—1.9 ...	10	1	8	0
More than 1.9 ...	63	0	13	3

*1 sq. dm. is approximately equal to the internal area of a tube 6½ in. long by ¾ in. nominal bore.

Out of 80 cold water failures, 63 had more than 1.9 mgm. of carbon per sq. dm. and only seven had less than 1.0 mgm./sq. dm., while out of 13 unpitted cold water pipes none had more than 1.9 mgm./sq. dm. and all but one had less than 1.0 mgm./sq. dm. The correlation between the presence of carbonaceous films and the occurrence of pitting in hot water pipes is less definite.

These figures indicate that carbonaceous films were responsible for at least three-quarters of the cold water pipe failures examined. Some at least of the remaining failures are thought to be due to a certain type of oxide scale formed in the tubes during manufacture. It is believed that the carbonaceous films are formed during manufacture by decomposition of remnants of drawing lubricant when a non-oxidising atmosphere exists in the tube during annealing. The only type of oxide scale with which pitting has been associated is a closely adherent, shiny, reddish layer.

Both carbonaceous films and the oxide scales just described lead to pitting in waters which do not contain the inhibitor by providing large cathodic areas which localise attack at pores in the film or scale. There is ample evidence that copper water pipes free from such carbonaceous films and oxide scales are satisfactory even in uninhibited waters.

Failures of copper water pipes are encountered in relatively few areas in this country, yet it is almost certain that some of the pipes installed in other areas will have contained carbonaceous films or oxide scales of the above type. It can be concluded that the presence of such films or scales will initiate pitting and lead to failure only in supply waters which do not contain the inhibitor referred to.

Metal Casting Regulations

NEW regulations affecting metal casting procedure have been made by the Minister of Labour (The Foundries (Parting Materials) Special Regulations, 1950). The regulations, which apply to all metal casting factories, prohibit the use as a parting material of any substance containing compounds of silicon, calculated as silica, exceeding 3 per cent, or of dust or other product of fettling or blasting. There is no prohibition of the use of natural sand, zircon, calcined china clay or aluminous fireclay, calcined or fused alumina or sillimanite, if they contain no other silica.

Antimony Oxide in U.S.A.

A NEW smelter, costing $1.75 million and capable of producing 9000 tons of antimony oxide a year, as well as antimony metal, has been put into operation at Stibnite, Idaho, by the Bradley Mining Co., of San Francisco.

Concentrates from Stibnite were formerly shipped to the El Segundo plant of the Harshaw Chemical Co. for processing, but now the antimony ore is processed at Stibnite and only the finished antimony metal shipped.

PLASTICS PROSPECTS

Serious Rise in Production Costs

A CAREFULLY considered review of the problems confronting the plastics industry was made by Mr. Kenneth M. Chance, chairman of British Industrial Plastics, Ltd., at its annual ordinary general meeting held in London last week.

During the year ending October, 1949, stocks of urea were almost exhausted, and owing to anticipated supplies from this country not coming up to expectations it had been necessary to purchase from Germany, during the nine months ended June 30, 1949. This German urea had cost £17,000 more than would have been paid for urea made in this country.

Higher prices had also had to be paid for formaldehyde, wood pulp and white pigment, while in addition, packaging costs had greatly increased.

Fortunately, the peak of rising costs was now passed, as ample supplies of home-made urea became available in June.

The friendly co-operation of two competitors in the moulding industry was particularly referred to by the chairman, who stated that in these days when the British industrialist is so often maligned he was glad to be able to place on record the assistance of these firms, one of which had enabled his company to tender for and receive an order for a special moulding, while the other had loaned an injection press, pending the receipt of one on order.

Trading profits were £340,515 as compared with £383,448 for the previous year. The difference in profit, however, was not so great as it at first appeared as £20,000 had to be written off for disposal of stock.

Export during the year under review had nearly equalled in tonnage the total sales of moulding powders in 1939 and exceeded them in value.

Despite difficulties caused by the devaluation of sterling the chairman expressed confidence in the future, and referred to the completion of the new £400,000 factory which would double production.

Rubber-Paper Resists Chemicals

Papers with considerably improved resistance to water and chemicals (24 hours' immersion in 5 per cent solutions of standard acids) are claimed to have been made available by the incorporation in paper at the beating stage of a new neoprene rubber (Latex 735) produced in the E. I. Du Pont laboratories in New Jersey. The heated paper is expected to find practical uses in the packaging of chemicals and probably of fruit.

SOIL STABILISATION

Highly Effective—But Costly

EXCEPTIONALLY effective results in a new chemical approach to the problem of consolidating mud surfaces are claimed by a committee of civil and chemical engineers working at the Massachusetts Institute of Technology.

The actual stabilisation process is based on calcium acrylate, an organic chemical which is adsorbed by the soil particles. The later addition of two other compounds, sodium thiosulphate and ammonium persulphate, causes the calcium acrylate molecules to lock themselves together. Thus the soil particles are joined in a simple, fast chemical reaction.

The binding action begins two minutes or less after the mixing has taken place, and five hours after treatment the soil is an elastic mass with tensile strengths from 5 to 10 p.s.i.

"If the stabilised soil is allowed to dry in air for a week or more," says the report, "tensile strengths of 500 p.s.i. or even more are obtained—but this gain in strength is accompanied by a loss in elasticity. The soil becomes much harder.

"Rewetting of the dried soil causes a return of the material to its original rubber-like consistency.

"In the recent MIT tests of the process, a stabilised soil block 3-in. thick withstood a 16-lb. steel ball dropped on it from a height of 7 ft. The ball rebounded about 6 in. without causing any damage to the section."

The committee states, "The present cost of the chemicals is still high, but there is reasonable hope that if the chemicals were manufactured in mass production their cost would be substantially reduced."

Camphor Project

THE possibility of manufacturing camphor from a common weed, known in Ceylon as madurutala, is being investigated by an Indian industrialist, Mr. K. G. Chacko.

The Indian Institute of Forest Research has proved that an acre of madurutala can produce 80 lb. of camphor and 60 lb. of camphor oil, Mr. Chacko asserts.

The price of camphor in the local market today is Rs.10 per lb.

Mr. Chacko has also suggested that the Government should utilise the country's prolific Kone trees for the cultivation of lac on a commercial basis. Home industries, he says, could absorb anything such a local industry produced.

The Chemist's Bookshelf

ENCYCLOPÆDIA OF CHEMICAL REACTIONS, Vol. III. Compiled and edited by C. A. Jacobson. New York: Reinhold Publishing Corporation. London: Chapman & Hall. Pp. xi + 842. 96s.

The first two volumes of this work have already been reviewed here (THE CHEMICAL AGE, *55*, 575; *60*, 165) and those familiar with the presentation of the material in those volumes will find no change in principle in the present one. The elements which have been added to this compilation of the published reactions of the elements and their simple compounds are as follows, the numbers denoting the separate entries for each element: cobalt, 822; niobium (under the American name, columbium) 58; copper, 611; didymium, 10; dysprosium, 5; erbium, 65; europium, 8; fluorine, 89; gadolinium, 27; gallium, 38; germanium, 185; gold, 148; hafnium, 3; holmium, 1; hydrogen, 252; illinium, 1; indium, 59; iodine, 307; iridium, 76. Thus, 34 elements in all have been covered in the first three volumes.

This list of elements calls for some comment. The extensive range of reactions listed for germanium and the surprisingly small selection revealed for fluorine are worthy of note. It is doubtful how far reactions listed under didymium can be regarded as properly included in the system—although one is less inclined to criticise extensions of the plan than omissions. There is little, however, that can be said in favour of the inclusion of illinium. It is true that in the introduction to this volume the editor explains that the Encyclopædia " is not designed to present the latest views of chemistry and chemical technology, but rather to summarise the facts presented in the published literature. Its users will therefore have the opportunity to evaluate previous experimental work when applied to present problems." It is doubtful whether any dialectic can justify the inclusion of information known to be incorrect, even in a work which is confessedly a simple compilation rather than a critical survey. It is unfortunate that it was not possible to begin the reactions of iodine on a fresh page. The running on directly from indium to iodine, in the middle of a page with no indication of a break, is a trifle confusing.

Such criticism does not invalidate the fact that the new volume will be cordially welcomed. Its usefulness as a whole can perhaps best be gauged by the frequency with which the reviewer finds occasion to wish that the elements under the second half of the alphabet had received the same attention as these first 34 elements. The excellent name and formula indexes of reagents and products of reaction permit easy reference.

It is regrettable, though presumably unavoidable that, although there are slightly fewer pages in this volume than in Volume II, the price is one-third higher. However, those possessing the earlier volumes and aware of the many occasions on which they have found them valuable for reference, will not consider even this price prohibitive.

POLISHES: THEIR RAW MATERIALS AND MANUFACTURE. By Dr. J. and A. Davidsohn. 1949. London: Leonard Hill, Ltd. Pp. 175. 15s.

The production of polishes calls not only for purely operative skill, but also demands a thorough knowledge of the raw materials and of the processes of manufacture. The practical man, working to given specifications, not infrequently finds himself in difficulties when some of the raw materials are involved in a specification unobtainable in the necessary quality, etc. A welcome feature of the book is its treatment in detail with substitutes for scarce raw materials, mainly with British substitutes for montan wax (described in 1946 by the Fuel Research Board in Technical Paper No. 52) or with other synthetic waxes of British origin. The book takes account of a number of polishes, in addition to shoe and floor polishes, and the authors have included much material derived from their own practical experience and recent research. An appendix deals with tables and conversion factors and with some simple analytical tests.

Technical Publications

ACIDS too corrosive to be handled by any commercially available metallic alloy require special pumping equipment. Two types of SRL rubber-lined sand pump for standard and heavy duty are described in bulletin No. P.9-B.6 now available from the Denver Equipment Co., Colorado, U.S.A., which gives instructions for installation, operation and maintenance.

* * *

NEW applications of the detergent and wetting agent Santomerse No. 1, in the rubber industry are described in technical service bulletin No. 6A/1 now available from Monsanto Chemicals, Ltd., London. Surface tack of freshly sheeted rubber is shown to be much reduced by treatment with aqueous solutions of Santomerse and its effects on plying up and aqueous suspensions are explained.

* * *

PHONIC motor timing devices as incorporated in the crystal time standards used in laboratories are described in a bulletin (B-601.C) recently issued by Muirhead & Co., Ltd., Beckenham, Kent. Two types are described one (D-199) with one commutator and the other (D-193) with two.

* * *

COMPLETE papers and reports of discussions and proceedings of the National Smoke Abatement Society conference held at Harrogate last year are now available in booklet form. The question of cost of installing plant for smoke abatement was not apparently discussed, and it would be of interest to know how far this has barred, or led to the deferment of, a number of promising projects.

* * *

GUIDANCE to ensure consistency of weld size and strength, production of spot welds of uniform quality, etc., is given in a booklet "Recommended Practice for the Spot Welding of Low Carbon Mild Steel Sheet" now available from the British Welding Research Association, London, as one of its Techniques and Memorandum series.

* * *

A WIDE variety of subjects is covered in the spring list of books published by Ernest Benn, Ltd., and includes "The History of the Gas Light and Coke Company," by Stirling Everard; "Terrace's Notebook for Gas Engineers and Students," by John Terrace; and "Civil Engineering Drawings, Specifications and Quantities," by J. Marshall Roger.

THE January issue of the Nickel Bulletin (the Mond Nickel Co., Ltd.) contains an article by W. H. Richardson, chief metallurgist of Langley Alloys, Ltd., on "Casting in Nickel-Molybdenum and Nickel-Molybdenum-Chromium Alloys." Such alloys, highly resistant to the attack of hydrochloric and other non-oxidising acids, have been available for some time in the U.S.A. (Hastelloy, Chlorimet and Chemalloy). Development here began at the end of the war and the article describes the properties of the series of alloys marketed as Langalloy. The issue includes many abstracts of interest relating to the performance of nickel alloys in chemical processes.

* * *

INCREASING activities of the Engineering Centre, Ltd., Glasgow, are reported in its quarterly news bulletin (No. 7, January, 1950) now available. The centre, which started three years ago with 127 firms now has 307 members, and is playing an increasing part in all engineering matters.

* * *

AN excellent example of informative publicity, in this instance to encourage wider use of glycerin and its derivatives, is the booklet being distributed by the Glycerine Producers' Association, New York. This provides a very comprehensive review of the essential characteristics of glycerin and mixtures and solutions, including much material worth preserving for reference purposes. Most of America's glycerin still comes from the soap makers and fat splitters—some 200 of them, with an increasing supplement from the petroleum industry, based on the chlorination of propylene.

* * *

THE great development of recent origin of synthetic waxes is reflected in the new 16 pp. catalogue produced by Glyco Products Co., Inc., 26 Court Street, Brooklyn 2, New York. It is concerned with the commercially pure products of the amide and ester type and offers much essential information on such topics as solubility, specific gravity, melting point, flash point, colour and acid value. The marked interest in these synthetic materials is intensified by the relative expensiveness and scarcity of the national products and the multiplication of the fields in which the substitutes are being successfully applied.

HOME

More Pharmacists

The number of British pharmacists rose to 25,662 last year, states the Registrar of the Pharmaceutical Society. The increase (214) was the largest since 1939.

Lever Memorial Unveiled

A memorial to the 1039 men and women from the Lever Brothers organisation who fell during the war, was unveiled at Unilever House, London, on February 15 by Sir Herbert Davis, joint vice-chairman of Lever Brothers & Unilever, Ltd.

Prices of Refined Oils

The Minister of Food announces that no change will be made in the prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users during the eight-week period ending on April 22.

Stainless Steel Tubing

A further rise in the cost of stainless steel tubing is authorised by a new Ministry of Supply order, the Control of Iron and Steel (No. 77) Order, 1950. An increase in the permitted maximum price of mild steel wire flats is also notified in this order, which became effective on February 23.

Coal Output Reduced

Production of coal in Great Britain last week fell slightly, to 4,339,800 tons, compared with 4,352,200 in the previous week, but was 5200 tons higher than the same week last year. The first eight weeks of this year gave 34,322,700 tons, which is more than half a million better than the same period of 1949.

Britain's Largest Technical College?

The Royal Technical College, Glasgow, has become the largest technological college in Great Britain, declared Sir James French, when he presided at a meeting of the governors on February 14. The annual report showed that for the session 1948-49 there were 2425 day and 3619 evening students, 10 per cent more than the previous session. Dr. D. S. Anderson, the director, said that, compared with pre-war sessions, there were now two and a half times as many day students and nearly twice as many evening students. Extra accommodation has been provided by erecting light structures in the wider corridors on several floors of the building. This had added one major and one minor laboratory, one departmental laboratory, and 11 staff rooms.

Alum Chemicals for the U.S.A.

Alum chemicals, manufactured by Peter Spence & Sons, Ltd., at the company's recently completed plant at Widnes, are being imported into the U.S.A. by C. Tennant, Sons & Co., New York. The English products distributed by the Tennant company include ammonia alum, potash alum, and iron-free aluminium sulphate.

Freeing Imports

A Board of Trade regulation, conforming with the policy of liberalising inter-European commerce, dispenses from March 1 with the need for individual import licences for a number of additional commodities, among them quartzite, abrasive soaps (containing less than 6 per cent anhydrous soap), soapless detergents, carboys and carboy covers.

Chemical Research Fellowships

Applications for one Ramsay Memorial Fellowship for chemical research will be considered by the trustees in June. Value of the Fellowship, normally tenable for two years, will be £400 a year, to which a grant for research expenses may be added, not exceeding £100 a year. Applications should be forwarded to the joint honorary secretaries, Ramsay Memorial Fellowships, University College, London, not later than April 17.

Biochemistry Course

A series of lecture demonstrations in biochemistry will be held in the chemistry and biology department of Acton Technical College, W.3, during the summer term. Dr. A. E. Dender, who is the lecturer for the whole course, will speak on "The Elements of Nutrition," "Enzymes, Their Nature and Function," and "The Metabolism of the Living Cell." Registration forms are obtainable from the Principal of the College.

2100 Years' Service

The Triplex Safety Glass Co., Ltd., and its subsidiary, Quickfit & Quartz, Ltd., of Stone, Staffs., are forming a "21 Club" for employees and directors with 21 years' service. It is believed that about 100 already qualify, including Mr. Kenneth Horne, the sales director. Sir Graham Cunningham, chairman and managing director of Triplex, who will qualify for membership at the end of the year, will preside at an inaugural lunch, probably at Birmingham, at which every member will be presented with a watch, cigarette-case or silver salver.

PERSONAL

DR. W. H. GARRETT, director of Monsanto Chemicals, Ltd., was this week presented with the Liverpool University Chemical Society's medal, which is awarded annually for distinguished service to chemistry in the academic or industrial sphere. The doctor, who joined Monsanto in 1917, was appointed to the board in 1935, and became director of production ten years later. Dr. Garrett addressed the society on the subject of universities and industry (*page* 325).

MR. WILLIAM WILLIAMS, of the chemicals division of Lever Brothers (Port Sunlight), Ltd., has been awarded £10 for an idea which will result in an economy of the division's use of steam. The presentation was made by Mr. G. A. I. Nairn, chairman of the company. Mr. Williams, who has been with Lever Brothers for 37 years, received a similar award less than a year ago.

MR. JOHN WILLIAM RAMSDEN, of Wyke, Bradford, sailed last week on the *Queen Mary* to join the technical staff of the Bradford Dyers' Association's Canadian subsidiary.

Liverpool and District Branch of the Institute of Export on February 20 elected as chairman for the ensuing year MR. FRED H. HUTTY, managing director of Northern Industrial Chemicals, Ltd.

MR. E. S. WADDINGTON, of the industrial department of Philips Electrical, Ltd., has been appointed to the executive committee of the International Welding Congress of 1951.

MR. IAN FERGUSSON, chairman and managing director of Evans Medical Supplies, Ltd., has been elected to the grand council of the Federation of British Industries for the next three years.

Obituary

MR. ARNOLD R. CLEMINSON, chairman of Reckitt & Colman, Ltd., Hull, died last week. He was 66 and had been with the company since 1898. In 1909, he was appointed secretary and, ten years later, became a member of the board. Mr. Cleminson played a leading part in the negotiations for the merger with Colman's in 1938.

CHEMICAL PLANT REQUIRED

AN American consultant has asked THE CHEMICAL AGE for information regarding chemical plant manufacturers interested in supplying machinery for two new factories, one for the production of penicillin and the other to produce ethyl alcohol from sulphite waste liquor for paper plants.

Machinery needed, some of the orders for which could be placed in the United Kingdom, includes the following:—

1, agitator with mixing tanks; 2, air conditioning apparatus; 3, air compressor and filter; 4, steel tank air receivers, pressure air receiver; 5, plant scale autoclaves; 6, treatment system for feed water boiler; 7, steam boiler; 8, distilling columns; 9, solvent extraction columns, condenser for fractioned redistilling solvent; 10, distilling off and stripping solvent column; 11, water cooler, natural draught cooling tower; 12, water demineralisers; 13, distillery equipment; 14, high-vacuum freeze driers; 15, liquid-liquid extractors, counter current vessels and agitators; 16, fermenters, fermentation equipment; 17, continuous rotary filters; 18, fittings; 19, gears; 20, labelling machines for cylindrical bottles; 21, 96 electric motors (many explosion proof) from 0.25 to 15 h.p.; 22, low-pressure mercury vapour quartz lamps; 23, pipes; 24, pumps with various output from 2 to 80 m^3/hour; 25, refrigeration machinery; 26, automatic scales, filling and capping 20,000 sterile bottles a day; 27, plant scale water stills, distilling 10,000 litres, redistilling 3000 litres; 28, alcohol fractionating stills for sulphite waste liquor; 29, air receiver steel tanks; 30, tubes; 31, stainless steel vessels, mixing vessels, seed vessels, storage vessels; 32, bottle washing, drying and sterilising machines, 20,000 a day; 33, machinery for production of yeast from pentose of sulphite waste liquor; 34, steam power for the production of electricity.

Small glass bottles as containers for penicillin are also required.

Instrumentation in Chemistry

THE application of physics to industrial problems at Billingham was the subject of a paper read by Dr. N. P. Inglis, director of I.C.I.'s metals division, to members of the Physical Society at Billingham last week.

Chemical industry's demand for continuously-recording instruments was now firmly established, said Dr. Inglis. They opened the way to automatic control of plant operations.

By the use of infra-red or ultra-violet absorption spectroscopes, analysis of fairly complex materials could be carried out in a few hours, but ordinary chemical analysis would take at least a week, he said.

The Physical Society visitors had the opportunity of viewing an exhibition of instruments used at Billingham.

· OVERSEAS ·

Cyclotron Destroyed

The cyclotron at Princeton University, one of the first to be installed in the U.S.A., is reported to have been destroyed by a fire, the cause of which is not yet revealed.

Anti-Trust Suit

The U.S. Government anti-trust suit against E. I. Du Pont de Nemours & Co., alleging that the company monopolised the production of cellophane, has been started by the U.S. Government Attorney. The hearing is likely to be deferred until November.

Winnipeg's First Refinery

Canadian Kellogg, Ltd., has been awarded a contract by Imperial Oil, Ltd., for engineering and constructing a complete new refinery in Winnipeg, Manitoba. It will have a capacity of 12,000 barrels per day and is scheduled for completion by May, 1951. This is Winnipeg's first refinery and will include an atmospheric and vacuum pipestill, a fluid catalytic cracking unit, a treating plant for gasoline and middle distillates, an electric substation and a utility plant.

U.S. Export Controls Lifted

Export controls on a number of important minerals, ores and metals have been lifted by the U.S. Department of Commerce. The freed commodities are: Fluorspar; kyanite and allied minerals; copper ore and concentrates; nickel ore, concentrates and matte; zinc ore and concentrates; battery shells and parts; quicksilver or mercury; chromium or chromite ores and concentrates; manganese ores and concentrates; titanium, ilmenite, and rutile ores and concentrates; manganese metal and alloys; and insulating material (except porcelain, glass and rubber).

Chilean Oil Exploitation

The first part of the Chilean Government's plan for the domestic production of oil is completed, according to a statement by the vice-president of the Industrial Development Corporation. At a cost of Pes. 550 million, 29 wells had been sunk at Cerro Manantiales, and eight in other parts of Magallanes Territory; 16 of these were in operation and the total output was 2000 barrels daily. An agreement had been concluded with Uruguay for the supply of some $2 million worth of crude oil during 1950. A similar agreement was being sought with Argentina.

Medical Company's Pakistan Branch

Evans Medical Supplies, Ltd., has opened a branch establishment in Karachi to serve East and West Pakistan. Mr. W. G. Poole has been appointed acting manager.

U.S. Aluminium Production Again Reduced

Continued strikes reduced the output of primary aluminium in the U.S.A. in November by 22 per cent from the preceding month. The total of 35,865 short tons was the lowest average daily rate of production since July, 1946. Stocks were reduced by 6869 to 39,738 short tons. Prices of primary pig and ingot remained unchanged.

Nearly 100 m. Tons of U.S. Steel

United States steel capacity now approaches 100 million short tons a year, the American Iron and Steel Institution reports. The new record level is 99,392,800 tons of ingots and steel for castings, about 11 million tons more than the combined world output last year. American steel companies will spend some $468,000,000 on expansion and modernisation.

Large New Magnetite Deposits

A report by Dr. Renato Zoppis de Sena, geologist to the Ministry of National Economy in Ciudad Trujilli, confirms the existence in the Duarte Province of the Dominican Republic of extensive deposits of magnetite capable of producing 1 million tons of high grade iron ore annually "for many generations." The ore is reported to contain an average of 68 per cent of metallic iron and is accessible.

Austrian Oil Refinery Project

A report to hand from Austria states that the financial group which has for some time been planning to erect a modern cracking plant in the dock-area of Linz on the Danube, has just formed a company (the full title of which is not yet available) with an initial capital of 15 million Austrian shillings. In co-operation with the Austrian Nitrogen Works, of Linz, the new concern plans to manufacture high grade lubricating oils, diesel oil (both of which are in short supply in Austria) and several derivatives used for the manufacture of pharmaceutical products, etc. Machinery and equipment is to be transferred from the underground refinery at Ebensee, which was built during the war. The new plant will treat Middle Eastern crude imported via Trieste.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

J. H. & A. COLE, LTD., Bristol, fertiliser manufacturers, etc. (M., 4/3/50.) February 2, mortgage and charge, to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on land and buildings in Feeder Road, and in or near Feeder Road, St. Philips, Bristol, with machinery, fixtures, etc., also a general charge.

Satisfaction

BLACK, TAYLOR & COWELL, LTD., Farnworth, soap manufacturers, etc. (M.S., 4/3/50.) Satisfaction February 7, of mortgage registered June 20, 1947.

Company News

Ilford, Ltd.

The net profit for the year ended October 31, 1949, was £312,388. The directors recommend payment of a dividend of 25 per cent, less tax, on the ordinary share capital. £121,891 is to be carried forward. A further £150,000 (after provision for taxation) has been placed to a replacement reserve.

New Registrations

Institiud Ceimice na Eireann (The Institute of Chemistry of Ireland)

Company limited by guarantee, without share capital (13,183). Registered in Dublin, January 28. To promote the advancement and knowledge of chemistry in all its branches. Subscribers: D. Crowley, University College, Dublin; W. Cocker, Professor of Chemistry; Thomas Dillon, Professor of Chemistry, University College, Galway; V. C. Barry (Medical Research Council of Ireland); D. Hurley; and six others.

Process and Chemical Engineering Co., Ltd.

Private company. (478,545). Capital £500. Manufacturers of chemical and process plant, etc. Directors: S. P. Bennett, and J. G. Irving.

Increases of Capital

The following increases in registered capital have been announced:—EAST ANGLIA CHEMICAL CO., LTD., from £2200 to £10,000; HILLS & SONS, LTD., from £10,000 to £58,000; WILLIAM BRIGGS & SONS, LTD., from £300,000 to £500,000; FERRAMIC INDUSTRIES, LTD., from £20,000 to £60,000; HICKSON & WELCH, LTD., from £110,000 to £200,000; JAMES ROBINSON & CO., LTD., from £42,000 to £100,000; DUTTON & REINISCH, LTD., from £100 to £5000.

Changes of Name

The following changes in name have been announced:—M. L. ALKAN, LTD., to M. L. ALKAN (SALES), LTD.; COURTIN & WARNER, LTD., to WARNER'S TECHNICAL SERVICES, LTD.; PREMIER BLUE CO., LTD., to ISOPOL CHEMICAL CO., LTD.

Explosion Hazard Reduced

THE risk of explosion of mineral gas, an instance of which was cited in a news paragraph last week (THE CHEMICAL AGE, 62, 307), is stated to have been greatly reduced at a Belgian colliery.

This has been achieved at La Bouverie Colliery, near Mons, which pumps off the firedamp gas and sells it to the local gasworks, reports a correspondent of the *Financial Times*.

The gas tapped from the pockets has been found to be twice as rich in thermal content as ordinary town gas. When neighbouring pits are treated in the same way the company's gas production is expected to approach 1 mil. cu. ft. a day.

Healthier conditions in the galleries are claimed to be produced by reducing the draught set up by the artificial air flow created to expel the firedamp. Less dust is raised. It should, therefore, be possible to increase the labour force and the tonnage of coal raised.

The Stock and Chemical Markets

STOCK markets have been perplexed by the outcome of the General Election. It is clear that the Government has no mandate to carry on with its nationalisation plans. Because of this, it is not surprising that insurance, cement, sugar, and chemical shares have turned firmer this week.

An exception has been iron and steels, although it is clear that there can at present be no question of carrying through steel nationalisation. Sharp falls in iron and steel shares earlier in the week tended to bring in buyers later, because, in most cases, yields are attractive and prospects of maintaining dividends considered good.

Chemical and kindred shares have naturally moved quite closely with the general trend of markets. The latter fell sharply on Friday of last week when first election results indicated the possibility of a good Labour majority, but later recovered when final results greatly reduced the Labour lead.

On Friday last week, Imperial Chemical were down to 41s., but have since rallied to 42s. 6d. Monsanto have been steady at 51s. 3d. Fisons, at 23s. 3d., have been fairly steady, despite the company's big new capital plans, issue terms of which are expected to be announced officially before long. Albright & Wilson have remained at 28s. 9d., Brotherton were 19s. 3d., and Boake Roberts 5s. shares 25s. 6d. Amber Chemical 2s. shares were dealt in at 4s. 9d., and F. W. Berk 2s. 6d. shares were 13s. 9d. Bowman Chemical 4s. shares were 5s. 3d., Pest Control 5s. shares 8s., and L. B. Holliday 4½ per cent preference were around 19s. 9d.

Turner & Newall, at 79s., regained most of an earlier heavy fall, while United Molasses rallied to 39s., Lever & Unilever to 41s. 9d., and British Aluminium were good at 41s. Borax Consolidated deferred at 54s. turned firmer, and British Oxygen at 93s. 9d. regained most of an earlier small decline, the market expecting the past year's results (with the dividend maintained, and probably an issue of additional shares to be made to shareholders on attractive terms) to be well received.

The view that conditions in the plastics industry are beginning to improve helped British Xylonite (58s. 9d.), and British Industrial Plastics 2s. shares were active around 5s.; De La Rue rallied 1s. 9d. to 23s. Although best levels were not held, British Glues 4s. shares remained active and were 20s. at the time of writing. Triplex Glass remained active, but eased to 19s. 6d. The 4s. units of the Distillers Co. receded to 17s., but later firmed up to 17s. 3d.

Among iron and steels, United Steel fell back to 26s. 9d., and most of the other leaders were lower because of the continued uncertainty of nationalisation.

Boots Drug were 48s. 6d., and Glaxo Laboratories failed to hold best levels, but were better on balance at 45s.

Market Reports

THERE is little change in conditions on the industrial chemicals market, the indecisive result of the General Election not having any particular influence. The volume of export trade continues to be maintained and price changes of importance have been reported. The soda products generally continue in steady demand, with an active request reported for caustic soda, soda ash and chlorate of soda. The potash chemicals remain firm and a fair amount of new inquiry for most items is apparent. Bleaching powder, formaldehyde, hydrogen peroxide and borax are all in good call, while the non-ferrous metal compounds are receiving fair attention at unchanged rates. Most items in the coal tar products market are moving well and prices remain unchanged.

MANCHESTER.—From the point of view of actual deliveries for consumption by the home market, Manchester chemical traders have had a satisfactory week. The cotton and woollen textile trades in Lancashire and the West Riding are calling for steady deliveries and there is a good aggregate movement of supplies to the other leading industrial outlets. Both inquiry and actual new business during the past week have been on a fair scale. Among the fertiliser materials there is an improving demand for superphosphates and sulphate of ammonia. Most sections of the tar products market are experiencing a fair demand.

GLASGOW.—There is little to report from the Scottish chemical market apart from the general slackening of orders, which appears to have been due to the Election. It is anticipated, however, that the orders will be placed next week, and that the turnover will be up to the usual standard.

CANADA'S CHEMICALS

Continued Expansion Expected

CHEMICAL prospects in Canada for 1950 appear excellent, reports the Toronto Purchasing Agents' Association. Large tonnage of chemicals is being contracted for and the supply position in Canada is much more favourable than it was a year ago. Some decrease in the price of British and European chemicals is anticipated and it is noted that they are being made available in greater quantities than before the war.

Alcohols remain firm in price and the supply is good. Liquid caustic soda is in excellent supply, but chlorine tightened somewhat during the latter part of January. Sodium silica fluoride prices have lowered, with the British and European suppliers competing for tonnage orders. The price of this material in carloads has been reduced about 4 cents per lb. The Steel Co. of Canada, Ltd., Hamilton, has announced that with effect from February 1 their tank car prices and drum lots on benzol were advanced by 2½ cents per Imperial gallon. Coal tar chemicals such as toluol, xylol are not so free as their petroleum derived equivalents.

1948 Production Reviewed

Production by factories in Canada which were engaged principally in the manufacture of fertilisers was valued at $63,986,000 in 1948, compared with $58,784,000 in 1947, the Bureau of Statistics reports. In addition there was a production of 236,000 tons of cyanamid, ammonium sulphate, mixed fertilisers and fish fertilisers valued at $10,068,000 in 1948 and 234,181 tons at $8,023,000 in 1947, by establishments which were classified to other industrial groups. The quantity of fish used as fertiliser in 1948 amounted to 57,248 barrels valued at $62,485.

Thirty-three plants were occupied chiefly in manufacture of fertilisers in 1948. Total production of mixed fertilisers in 1948 from all industries amounted to 650,228 tons worth $22,738,000 at factory prices and included 641,056 tons ($22,220,000) made by plants in the fertiliser manufacturing industry and 9172 tons ($518,204) made in the meat packing, oils and fats and the adhesive industries.

Ammonium sulphate was made by Consolidated Mining & Smelting, Ltd., at Trail, and also by a number of coke manufacturers. Production during 1948 amounted to 215,109 tons.

ISRAELI POTASH

National Control to Predominate?

THE finance committee of the Israeli Parliament is reported to be considering a proposal that the Palestine Potash Co., Ltd., should be changed from British to Israeli ownership. A ministerial committee recommended that the Government of Israel should take a $2.5 million interest in the company, that the board should be reconstituted to have a majority of Jewish members, and that the company's registration be transferred from London to Israel.

This would appear to conflict with a statement by the Israeli Government, denying nationalisation intentions and advising the Palestine Potash Company to participate with financially powerful groups for the fuller exploitation of the Dead Sea's minerals (THE CHEMICAL AGE, *61*, 310).

The question of raising capital for the resumption of work must await the outcome of the Israeli Government's discussions, said an official of the company in London last week. At the company's works at the northern end of the Dead Sea it has been observed that, although plant had not been destroyed, some of the heavier units had been moved to Jordan.

Ceylon Will Export More Soap

CEYLON is expected shortly to increase her exports of soap, especially to India and Pakistan. The present export of soap from the Island amounts to about 200 tons a year. It is proposed to increase this amount to about 500 tons a year.

The local soap industry is at present made up of five large concerns and about 100 units organised on a cottage industry basis, the latter being of diminishing importance. Total capacity is about 20,000 tons a year.

Mr. A. Ratnayake, Minister of Cooperative Undertakings, recently opened a new soap factory installed in Colombo by the Eastern Chemical Industries, Ltd., which has installed the latest machinery for the manufacture of high-class soap. Soap imports, except of some medicated types, are banned in Ceylon.

Norwegian Superphosphates Factory

The new superphosphate factory of the Norske Zink Kompanie, at Odda, Norway, has started production with a provisional capacity of 40,000 tons annually. It is hoped to increase this to 80,000 tons.

Next Week's Events

MONDAY, MARCH 6

The Chemical Society

Galway: University College, 7.45 p.m. (With ICA, RIC and SCI). Prof. M. Stacey: "Deoxy-sugars and Nucleic Acids."

Society of Chemical Industry

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1. 6.30 p.m. Dr. S. T. Henderson: "Recent Developments in Fluorescent Materials."

TUESDAY, MARCH 7

The Institute of Fuel

London: Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. A. E. Margolis: "District Heating in the New Towns."

Electrodepositors' Technical Society

Birmingham: James Watt Memorial Institute, Great Charles Street. G. H. Hands: "Experiences in Bright Nickel Plating."

Incorporated Plant Engineers

Cardiff: Grand Hotel, Westgate Street, 7.30 p.m. J. Barrington Stiles: "Metallising for Industrial Plant Maintenance."

WEDNESDAY, MARCH 8

Royal Society of Arts

London: John Adam Street, W.C.2, 2.30 p.m. Prof. M. L. Oliphant: "The Industrial Applications of Atomic Energy."

Association of Scientific Libraries and Information Bureaux

London: Institution of Electrical Engineers, Savoy Place, W.C.2, 5.30 p.m. F. C. Francis: "The British National Bibliography."

Society of Chemical Industry

London: 11 Chandos Street, Cavendish Square, W.1, 6 p.m. Microbiological panel A.G.M. 6.15 p.m. Dr. G. Pontecorvo: "The Impact of Genetics on Microbiology."

THURSDAY, MARCH 9

The Chemical Society

Aberdeen: Marischal College, 7.30 p.m. Prof. H. B. Nisbet: "The Chemistry of Anæsthetics."

Nottingham: University, 6.30 p.m. Prof. W. Wardlaw: "Some Aspects of Structural Chemistry."

Manchester: University, 6.30 p.m. Prof. J. W. Cook: "Polycyclic Aromatic Hydrocarbons."

Society of Chemical Industry

Nottingham: Technical College, 7.15 p.m. E. Morgan: "High Duty Irons."

The Royal Society

London: Burlington House, Piccadilly, W.1, 10 a.m. Discussion: "Bond Energies and Bond Lengths."

Royal Society of Arts

London: John Adam Street, W.C.2, 5.15 p.m. E. V. Parkinson: "The Growth of the Steel Industry in India."

The Pharmaceutical Society of Great Britain

London: 17 Bloomsbury Square, W.C.1, 7.30 p.m. Dr. J. O. Irwin: "Statistics and Biological Assay."

FRIDAY, MARCH 10

The Chemical Society

Glasgow: University, 7-15 p.m. Dr. A. H. Cook: "Purine Synthesis—A New Chapter."

Belfast: Agricultural Lecture Theatre, Elmwood Avenue, 7.30 p.m. R. A. Wells: "Inorganic Chromatography."

Society of Chemical Industry

Ipswich: Public library, 7.30 p.m. F. Armitage: "Recent Developments in the Surface Coating Industry."

Institution of Works Managers

Manchester: Engineers' Club, 6.30 p.m. P. H. Briggs: "The Application of Electronics in Industry."

Oil and Colour Chemists' Association

Manchester: Engineers' Club, 6.30 p.m. G. A. Campbell: "Dispersion and Wetting in Non-Aqueous Media."

The Institute of Metals

Birmingham: Chamber of Commerce, New Street. Symposium: "The Investigation of Alloy Systems."

SATURDAY, MARCH 11

Society of Leather Trades Chemists

Manchester: Engineers' Club, 2 p.m. J. N. Blake: "The Use of Hide Trimmings by the Gelatine Manufacturer."

SCI Summer Tour

A visit to Norway is planned for this year's summer tour of the Food Group of the Society of Chemical Industry, in the first week in June. Arrangements are being made for visits to factories and other establishments of interest in the Oslo and Bergen districts.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Disintegrators for the treatment of solid-bearing liquids.—Sulzer Frères Soc. Anon. June 4 1947. 634,585.

Manufacture of styrene compounds.—Distillers Co., Ltd., F. E. Salt, and W. Webster, and G. Galitzenstein. [Legal representative of E. Galitzenstein (deceased).]. June 24 1948. 634,587.

Apparatus for electrically precipitating suspended particles from gases.—American Air Filter Co., Inc. July 9 1947. 634,676.

Method of treating low-grade fatty stock to form alkyl esters therefrom.—Lever Bros. & Unilever, Ltd. July 15 1947. 634,411.

Process for the manufacture of dihalides of aliphatic mono-olefins.—N.V. De Bataafsche Petroleum Maatschappij, and R. S. Airs. July 18 1947. 634,414.

Production of synthetic resins.—J. W. Fisher, and E. W. Wheatley. July 22 1947. 634,591.

Method of coagulating dispersions.—B. F. Goodrich Co. July 25 1947. 634,680.

Process for the preparation of agar-agar.—T. S. Lian. July 31 1947. 634,596.

Process for the recovery of hydrocarbons from a sludge.—Universal Oil Products Co. Aug. 6 1947. 634,597.

Process for the production of synthetic drying oils.—Universal Oil Products Co. August 6 1947. 634,598.

Process for improving the tensile strength of polymeric materials.—E. I. Du Pont de Nemours & Co. April 15 1947. 634,600.

Pyrimidine derivatives.—I.C.I., Ltd., A. D. Ainley, F. H. S. Curd, and D. N. Richardson. Aug. 9 1948. 634,471.

Quinoline derivatives.—I.C.I., Ltd., and F. H. S. Curd. Aug. 9 1948. 634,531.

Catalytic isomerisation of solid hydrocarbons.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 22 1947. 634,602.

Process for the synthesis of hydrocarbons.—Standard Oil Development Co. Sept. 11 1947. 634,534.

Process for the preparation of reaction products of natural and synthetic rubbers with sulphur dioxide.—Rubber-Stichting. Oct. 23 1947. 634,536.

Production of poly-esters.—J. G. N. Drewitt, and J. Lincoln. Oct. 27 1947. 634,609.

Chemical treatment of sand for glass-making.—Standard Brick & Sand Co., Ltd., and H. D. Segrove. Nov. 16 1948. 634,479.

Adhesives for nylon.—I.C.I., Ltd. Dec. 19 1947. 634,422.

Production of luminescent calcium tungstate.—British Thomson-Houston Co., Ltd. Feb. 14 1949. 634,616.

Manufacture of amino-aldehyde adhesives.—I. F. Laucks, Inc. April 3 1946. 634,777.

Process for polymerising unsaturated compounds in the emulsified state.—N.V. De Bataafsche Petroleum Maatschappij. Feb. 20 1947. 634,789.

Method for the production of industrial mixtures of carbon monox de and hydrogen.—Standard Oil Development Co. April 21 1947. 634,933.

Vinyl resin compositions.—Carbide & Carbon Chemicals Corporation. April 30 1947. 635,011.

Process for the production of halogenated hydrocarbons.—N.V. De Bataafsche Petroleum Maatschappij. May 12 1947. 635,013.

Manufacture of insecticidal preparations.—Murphy Chemical Co., Ltd., and V. H. Chambers. May 14 1947. 634,934.

Methods of and plant for producing magnesium powder or powder metal mixtures containing magnesium.—American Electro Metal Corporation. June 4 1947. 634,799.

Process for the reconcentration of spent mineral acids.—Standard Oil Development Co. June 4 1947. 634,935.

Manufacture of trichloriminocyanuric acid.—C. H. G. Hands, F. R. Whitt, and J. W. C. Phillips. June 12 1947. 634,801.

Cellulose ether compositions.—Hercules Powder Co. July 7 1947. 634,808.

Reducing ferric oxide.—Dorr Co. Sept. 15 1944. 634,938.

Preparation of compounds of the cyclopentanodimethyl - polyhydrophenanthrene series.—Merck & Co., Inc. July 16 1947. 634,741.

Manufacture of carbonised fuel.—K. L. Storrs. July 29 1947. 634,814.

Purification of minerals.—United Glass Bottle Manufacturers, Ltd., R. Sturgeon, and E. Seddon. July 30 1948. 634,941.

Hydrocarbon synthesis.—Standard Oil Development Co. Sept. 3 1947. 634,882.

Methods for preparing barium and its alloys.—Compagnie De Produits Chimiques et Electro-Metallurgiques Alais. Froges & Camargue. Oct. 24 1947. 634,949.

Thiazolidone compounds.—Ilford, Ltd., J. D. Kendall, and G. F. Duffin. Nov. 9 1948. 634,951.

Process for preparing copper oxychloride.—N.V. Koninklijke Nederlandsche Zoutindustrie. Nov. 21 1947. 634,954.

Catalytic polymerisation of ethylene.—I.C.I., Ltd. (E. I. Du Pont de Nemours & Co.). Dec. 8 1948. 634,757.

Process for the preparation of amines having the ring system of lysergic acid or dihydrolysergic acid.—Sandoz, Ltd. Dec. 18 1947. 634,909.

Methylol pentadecyl phenol and its derivatives.—British Resin Products, Ltd., E. R. H. Jones, and I. K. M. Robson. Dec. 21 1948. 634,960.

Stabilisation of vinylidene chloride resins.—Distillers Co., Ltd., C. A Brighton, and D. Faulkner. Jan. 11 1949. 634,762.

Manufacture of aluminium phosphate.—British Aluminium Co., Ltd., A. Coulson, and V. J. Hill. Jan. 25 1949. 634,837.

Organic silicon derivatives.—A. H. Stevens. March 23 1945. 635,194.

Production of fluorine-containing hydrocarbon derivatives.—I.C.I., Ltd., and N. F. Sarsfield. Oct. 25 1946. 635,201.

Synthetic resin compositions.—Wingfoot Corporation. March 21 1946. 635,206.

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Printed in Great Britain by THE PRESS AT COOMBELANDS, Ltd., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4, 4 March, 1950. Registered at the General Post Office. Entered as Second Class Matter at the New York U.S.A., Post Office.

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